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| Course | Initiation Seminar |
| Course No. | 02RA010 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprA Intensive |
| Instructor | Satoru Takahashi, Hisashi Oishi |
| Course Overview | Initiation Seminar aims to lead the students to learn the purpose of human resource development and program curricula of the Ph.D. Program in Human Biology. Listening to practical lectures by academic researchers, government administrators, and entrepreneurs or researchers who successfully work at business companies, the students will understand the diverse career paths possible after completion of the program. In this seminar, the students will have discussions with their classmates on their future career paths and study proposals, and write a report on their learning objectives and future directions of their study. |
| Remarks | Lectures are conducted in English. 4/8-4/9 |
| Course Type | lectures |
| Outline | In this first course of the PhD program in Human Biology, the students study the aims and objectives of the program, curriculum policies, lineups and time tables of the curriculum, and possible research topics in the program. In the career path seminar, the students convince a wide variety of possible future careers through lectures by guest lecturers, have discussions with their classmates, and then make study plans for the program. |
| GIO (General Instructional Objective) | To understand the aims, objectives, and curricula of the program; convince wide possibilities of future careers; and make plans for class selection and research theme. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the aims and objectives of the program, 2. To be able to explain the curriculum policies of the program, 3. To be able to explain a wide variety of possible future careers, 4. To be able to explain the lineups and time tables of the curriculum, and learn the ways to select and register study subjects, 5. To be able to explain the contents of the syllabus and evaluation criteria of each subject, 6. To be able to explain the ways to select PhD research theme, 7. To write a report on study plans and desirable future career. |
| Course Schedule | Program Guidance (To be announced) Career Path Seminar (To be announced) |
| Homework | Discuss with initial mentors, fix the aims of studies in the PhD program in Human Biology, make plans for subject studies, and determine approaches to decide research themes. |
| Grading Methods and Criteria | <p>The students are evaluated by the attendance and activity of the presentation and discussion at the career path seminar, in addition to the performance of their reports.</p> <p>In addition to the above requirements, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further contribute others' study by active and useful discussions in the seminar are evaluated as A+, - Understand well the aims and objectives of the program and write excellent reports on their desirable future plans to solve global problems, are evaluated as A, |

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| Assignment | |
| Textbook: | Program Guide |
| Room Number | Hotel Green core Tsuchiura Guidance (Laboratory of Advanced Research A, Room 111) Career Path Seminar (To be announced) Satoru Takahashi satoruta at md.tsukuba.ac.jp http://www.md.tsukuba.ac.jp/public/basic-med/anatomy/embryology/index.html |
| Notes | |
| Keywords | |

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| Course | Initiation Seminar |
| Course No. | 02RA015 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallA Intensive |
| Instructor | Satoru Takahashi |
| Course Overview | Initiation Seminar aims to lead the students to learn the purpose of human resource development and program curricula of the Ph.D. Program in Human Biology. Listening to practical lectures by academic researchers, government administrators, and entrepreneurs or researchers who successfully work at business companies, the students will understand the diverse career paths possible after completion of the program. In this seminar, the students will have discussions with their classmates on their future career paths and study proposals, and write a report on their learning objectives and future directions of their study. |
| Remarks | Lectures are conducted in English. Not open in 2016. |
| Course Type | lectures |
| Outline | In this first course of the PhD program in Human Biology, the students study the aims and objectives of the program, curriculum policies, lineups and time tables of the curriculum, and possible research topics in the program. In the career path seminar, the students convince a wide variety of possible future careers through lectures by guest lecturers, have discussions with their classmates, and then make study plans for the program. |
| GIO (General Instructional Objective) | To understand the aims, objectives, and curricula of the program; convince wide possibilities of future careers; and make plans for class selection and research theme. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the aims and objectives of the program, 2. To be able to explain the curriculum policies of the program, 3. To be able to explain a wide variety of possible future careers, 4. To be able to explain the lineups and time tables of the curriculum, and learn the ways to select and register study subjects, 5. To be able to explain the contents of the syllabus and evaluation criteria of each subject, 6. To be able to explain the ways to select PhD research theme, 7. To write a report on study plans and desirable future career. |

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| Course Schedule | Program Guidance (To be announced) 1.Career Path Seminar(Sept. at Seminar House Joso) |
| Homework | Discuss with initial mentors, fix the aims of studies in the PhD program in Human Biology, make plans for subject studies, and determine approaches to decide research themes. |
| Grading Methods and Criteria | The students are evaluated by the attendance and activity of the presentation and discussion at the career path seminar, in addition to the performance of their reports. In addition to the above requirements, the students who; - Fulfill the requirements for grade A and B further contribute others ' study by active and useful discussions in the seminar are evaluated as A+ (top 10%), - Understand well the aims and objectives of the program and write excellent reports on their desirable future plans to solve global problems, are evaluated as A (upper 25%), - Write good reports suitable for their future career plans are evaluated as B, - Attend the guidance and career path seminar, understand the aims and objectives of the program and curriculum, and submit the report on their study plans for the program, are passed and evaluated as C or upper grades. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | Program Guide |
| Room Number | Seminar House Joso Guidance(Laboratory of Advanced Research A, Room 706) Career Path Seminar(Seminar House Joso) |
| Notes | |
| Keywords | |

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| Course | World-science Leaders' Seminar |
| Course No. | 02RA020 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | Annual by appointment |
| Instructor | Akira Shibuya |
| Course Overview | The students attending this seminar should be able to learn basic knowledge and recent research trends related to the specialized fields of world-leading researchers. The students should also be able to develop their professional and 'Cognoscente' skills for research as well as acquire skills of research presentation and discussion by discussing with their mentoring instructors the above topics including related matters. In addition, they are expected to gain a better understanding of research procedures and develop abilities to conduct research by writing a report. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Seminars on the specialized fields of researches are given by the world-leading researchers. The students attending this seminar should be able to acquire skills of research presentation and discussion by discussing with the mentoring instructors on the recent research topics and to develop the professional and cognoscente skills for researches and abilities to conduct researches by writing reports. |
| GIO (General Instructional Objective) | To read manuscripts related to the recent research topics learned in the seminars and to discuss with the mentoring instructors on them and related topics. To write reports on the recent research topics in order to deepen the understanding of researches. To develop an ability to understand manuscripts and to develop the skill of writing manuscripts. |
| SBO (Specific Behavioral Objectives) | SBO (Specific Behavioral Objectives): 1. To be able to explain the recent research topics learned in the seminars, 2. To be able to discuss the recent research topics and closely related topics, 3. To be able to develop how to write scientific manuscript by writing reports, 4. To be able to develop an ability to conduct researches by writing reports. |
| Course Schedule | Seminars are held irregularly. |
| Homework | |
| Grading Methods and Criteria | |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read manuscripts closely related to recent scientific topics. Discuss the contents of the recent research topics learned in this seminar and by reading the related manuscripts. Write at least three reports on the research topics related to the seminars given in this course. |

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| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building, etc. |
| Notes | To be announced if any. |
| Keywords | |

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| Course | Business Leaders' Seminar |
| Course No. | 02RA030 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | Annual by appointment |
| Instructor | Akira Shibuya |
| Course Overview | In this seminar, the students will listen to business leaders' omnibus lectures and submit reports on the key points of the lectures for feedback for themselves. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Navigating the labyrinth of international business and trade is a challenging and exciting undertaking. However, it can also be hard to deal with and costly process if undertaken without the necessary academic and professional training and experiences. In this seminar, business leaders are invited, who introduce the students to the achievements obtained through their academic and industrial activities including success and failure stories. |
| GIO (General Instructional Objective) | To understand the worldwide knowledge developments and foundations for international business and the cultural context for managing in an overseas environment. |
| SBO (Specific Behavioral Objectives) | 1. To be able to understand the complexities, risks, and opportunities of international business through the invited leader ' s talk, 2. To be able to learn global business strategies, 3. To be able to learn |
| Course Schedule | To be announced |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the attendance (50%) and reports (50%). |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | The students must attend the course and submit the reports to summarize the talks for three speakers. |
| Textbook: | No textbook is required. |
| Room Number | |
| Notes | |
| Keywords | |

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| Course | Lectures in Experimental Science |
| Course No. | 02RA040 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprAB Mon6 |
| Instructor | Keiji Kimura |
| Course Overview | In terms of main the research ideas of the lecturers, the Lectures in Experimental Science course provides the opportunities for the students to think of what hypotheses the lecturers generate for the basis of their research programs and what experiments the lecturers use to prove their hypotheses. This course is omnibus led by young researchers. |
| Remarks | Open in an even number year. Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Lectures explain below: -How do they think of their main research ideas? -What hypotheses are the bases of their research programs? -What experiments do they use to prove their hypotheses? This lecture is omnibus and is led by young researchers. |
| GIO (General Instructional Objective) | Students learn the skills how to get research ideas by listening the lectures ' seminar how they hypothesize and perform the experiments. Students also learn how to plan the experiments to prove their idea. |
| SBO (Specific Behavioral Objectives) | 1. To be able to understand and explain the significance of the talk of the lecturers, 2. To be able to have opinion to develop the experiments of the lecturers and express them. 3. To be able to propose their research plan by using the lectures ' seminar as reference |
| Course Schedule | 1.Introduction; Kimura K 2.The study of the brain environment regulated by protein metabolism; Tsuruta F 3.Roles of RNA binding proteins in translational control; Matsumoto K (Riken) 4.Making a chromosome from purified factors; Shintomi K (Riken) 5.Regulation of the meiotic cell cycle in oocytes; Kanemori Y 6.Molecular mechanisms for faithful chromosome segregation in mitosis and meiosis; Kawashima SA (Univ. of Tokyo) 7.Presentation by students; Kimura K 8.Presentation by students; Kimura K 9.Presentation by students; Kimura K 10.Presentation by students; Kimura K |
| Homework | |
| Grading Methods and Criteria | After attending the lecture, students must hand in reports, in which they must describe an idea to develop the experiment of each lecturer. Students must also summarize their (research) backgrounds and present their experimental plans. Students are evaluated by the reports after each class (70%) and their presentation (30%). |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read scientific journals. |
| Textbook: | References: - Tsuruta, F. et al., J. Cell Biol. (2009) 187, 279-294 - Matsumoto, K. et al., Mol. Cell. Biol. (2005) 25, 1779-1792 - Shintomi, K et al., Nature Cell Biol. (2015) 17, 1014-1023 - Miyagaki, Y. et al., Dev Biol. (2011) 359, 73-81 - Kawashima, SA. Et al., Science (2010) 327,172-177 |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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| Course | Serendipity in Human Biology |
| Course No. | 02RA050 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprAB Mon5 |
| Instructor | Tomoki Chiba |
| Course Overview | Serendipity in Human Biology engages the students in the researches and processes which trigger "unexpected discoveries" and "the breakthrough experiments and ideas" in each special field of Human Biology. As well as participating in academic discussion of the ideas and significance of those breakthroughs, original papers of related fields are read and discussed with the supervisor and others so that a report can be created and understanding deepened. By performing training which engages in detail with various fields of Human Biology students accumulate knowledge, polish practical skills, and understand how surprising, unpredictable developments in research arise from a scientific background of logical conceptual development. |
| Remarks | Open in an odd number year. Lectures are conducted in English. Not open in 2016. |
| Course Type | lectures |
| Outline | In this subject, professors inside/outside of the program including those from academic research and company institutes give recent research achievement, while students learn how researchers have opened new research fields. In particular, students try to understand the serendipity in Human Biology that results in the novel discovery and breakthrough ideas and experiments. |
| GIO (General Instructional Objective) | Students learn how researchers have opened new research fields, in particular, the serendipity in Human Biology that results in the novel discovery and breakthrough ideas and experiments. To deepen the above understanding, students discuss with professors and by themselves, read papers related to the topics, and make out reports from own aspects. By doing so, student learn the outlines of a variety of research fields in Human Biology, accumulate knowledge on Human Biology, cultivate applied skills, and simultaneously recognize the importance of the serendipity in Human Biology. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To understand the lecture content and explain it 2. To understand the content of papers related to lectures, discuss the quintessence with professors and other students, and deepen the understanding 3. To collect information about lectures by reading papers, make out reports from own aspects, and acquaint themselves with the scientific writing |

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| Course Schedule | 1.Dr. Tomoki Chiba 2.Dr. Hisashi Oishi 3.Dr. Keiji Kimura 4.Dr. Tadachika Koganezawa 5.Dr. Kaspar Vogt 6.Dr. Michael Lazarus 7.Dr. Atsushi Kawaguchi 8.Dr. Kiong Ho 9.Dr. Kazuko Shibuya 10.Dr. Shin-ichi Kashiwabara |
| Homework | |
| Grading Methods and Criteria | Students attend more than 8 classes and discuss well (Grade C), read several papers related to three topics and make out three reports (Grade B). The reports that point out the significance for the novel discovery and breakthrough ideas and experiments adequately are estimated to be Grade A. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | Original Papers related to each topic |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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| Course | CITI: Required Education for Human Research Participants (General Foundation) |
| Course No. | 02RA060 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | Annual by request |
| Instructor | Mitsuyasu Kato |
| Course Overview | CITI: Required Education for Human Research Participants (General Foundation) provides the opportunities for the students to learn ethical and legal knowledge required for human science research studies through e-learning systems hosted by the Collaborative Institutional Training Initiative (CITI). |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | CITI: Required Education for Human Research Participants (General Foundation) provides the opportunities for the students to learn ethical and legal knowledge required for human science research studies through e-learning systems hosted by the Collaborative Institutional Training Initiative (CITI). |
| GIO (General Instructional Objective) | To make deliberate research planning and manage activities of integrity on the basis of the research ethics and legal knowledge required for human science research studies. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the responsible conducts of human science research, 2. To be able to explain the biosafety/biosecurity and risk management, 3. To be able to understand the ethical and legal requirements for the research that the students focus on. |
| Course Schedule | 1.Register for the CITI and study all required programs regarding responsible conducts of research courses and biosafety/ biosecurity courses, 2.Finish animal care and use courses in the first year, if the students intend to use animal experiments, 3.Gain more than 80% correct answers for the embedded quizzes to finish the section, Make portfolios for references. |
| Homework | Discuss with classmates about the CITI e-leaning systems and contents. |
| Grading Methods and Criteria | The students are evaluated by the embedded quizzes and portfolios. In addition, the students who; - Fulfill the requirements for grade A and B further make an excellent reference file of research ethics and required legal knowledge and used it for their own research planning are evaluated as Superior (A+: top 10%), - Have active discussions on the ethics and legal issues with initial mentoring instructors and recognize to have enough knowledge are evaluated as Excellent (A; upper 25%), - Additionally on the above requirements, students who made a well-organized portfolio will be evaluated as Good (B), - Pass all required embedded quizzes and submit the portfolios pass the examination and evaluated as Average or upper grades (C or upper grades). |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | Online Study at- https://www.citiprogram.org/ |
| Notes | |
| Keywords | |

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| Course | CITI: Required Education for Human Research Participants (Elective) |
| Course No. | 02RA061 |
| Credits | 2.0Credits |
| Grade | 2Year |
| Timetable | Annual by request |
| Instructor | Mitsuyasu Kato |
| Course Overview | CITI: Required Education for Human Research Participants (Elective) provides the opportunities for the students to learn ethical and legal knowledge required for human science research studies through e-learning systems hosted by the Collaborative Institutional Training Initiative (CITI). In the Elective course, the students will select a subject of study from Bio-Safety and Bio-Security, Animal Care and Use, etc. |
| Remarks | Lectures are conducted in English. |
| Course Type | others |
| Outline | CITI: Required Education for Human Research Participants (Elective) provides the opportunities for the students to learn ethical and legal knowledge required for human science research studies through e-learning systems hosted by the Collaborative Institutional Training Initiative (CITI). In the elective course, the students will select a subject of study from Bio-Safety and Bio-Security, Animal Care and Use, and so forth. |
| GIO (General Instructional Objective) | To make deliberate research planning and manage activities of integrity on the basis of the research ethics and legal knowledge required for human science research studies. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the responsible conducts of human science research, 2. To be able to explain one of the specialized subjects among Bio-Safety and Bio-Security, Animal Care and Use, and so forth, 3. To be able to understand the ethical and legal requirements for the research that the students focus on. |
| Course Schedule | <ol style="list-style-type: none"> 1.Register for the CITI and study all required programs regarding responsible conducts of elective course subjects 2.Gain more than 80% correct answers for the embedded quizzes to finish the section, 3.Make portfolios for references. |
| Homework | Discuss with classmates about the CITI e-leaning systems and contents. |
| Grading Methods and Criteria | <p>The students are evaluated by the embedded quizzes and portfolios.</p> <p>In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further make an excellent reference file of research ethics and required legal knowledge and used it for their own research planning are evaluated as Superior (A+: top 10%), - Have active discussions on the ethics and legal issues with research supervisors and recognize to have enough knowledge are evaluated as Excellent (A; upper 25%), - Additionally on the above requirements, students who made a well-organized portfolio will be evaluated as Good (B), - Pass all required embedded quizzes and submit the portfolios pass the examination and evaluated as Average or upper grades (C or upper grades). |
| Grading Criteria | A+: Superior (more than 90: top 10%) |

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| Assignment | |
| Textbook: | None |
| Room Number | Online Study at https://www.citiprogram.org/ |
| Notes | |
| Keywords | |

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| Course | Communication in Human Biology I |
| Course No. | 02RA070 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprAB Mon2 |
| Instructor | Kiong Ho |
| Course Overview | A literature-based, seminar-type course for the students to evaluate and review the latest scientific breakthroughs and classical topics that significantly impact Human Biology. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | A literature-based, seminar-type course for the students to evaluate and review the latest scientific breakthrough and classical topics that significantly impact Human Biology. The goal of this course is for students to develop the proficiency they need to effectively and energetically communicate their professional achievements within the international scientific community. To this end, students in this course will practice scientific reading, presentation and feedback on their performance from peers and instructors. Upon completion of the course, students will have a foundation for sharing knowledge and ideas in the global arena of science. |
| GIO (General Instructional Objective) | To develop the proficiency they need to effectively and energetically communicate their professional achievements within the international scientific community. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To understand the essentials of current research topics 2. To build the capacity to introduce research topics to a general audience 3. To learn the state-of-research 4. To develop a knowledge base in designing experiments |
| Course Schedule | Class meets 10 times during spring 2013 semester. Topics to be discussed will be selected by the students, with an approval by the faculty member. At the end of the course, students need to submit a final report for the course. |
| Homework | |
| Grading Methods and Criteria | Students are evaluated based on their active participation, clarity of the presentation, discussion, and the quality of their report submitted. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Students are required to read the papers assigned for discussion. Students will prepare a written report for each topics discussed. |
| Textbook: | Research articles to be discussed for each class will be provided as a PDF files. |
| Room Number | Room 101, 4B building, Medical Area |
| Notes | |
| Keywords | |

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| Course | Communication in Human Biology II |
| Course No. | 02RA080 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Mon2 |
| Instructor | Kiong Ho |
| Course Overview | Consists of a literature-based, seminar-type course for the students to evaluate and review the latest scientific breakthroughs and classical topics that have significant impact on Human Biology. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | This is a literature-based, seminar-type course for first year graduate students. Students are expected to evaluate and review selected topic on Human Biology, and present research articles for discussion. |
| GIO (General Instructional Objective) | This course is designed for first year graduate student to present a research article on a selected subject. Topics include latest scientific breakthrough, as well as classical papers describing the significant impact on Human Biology. Student is expected to provide background information, hypothesis to be tested, and discuss the results, significance and future prospective of the research topic. |
| SBO (Specific Behavioral Objectives) | Student in this course is expected to learn: 1. How to organize and present research papers. 2. Modern and classical methodologies described in the research articles. 3. How to define hypothesis and understand the objective of the research. 4. How to critically think and evaluate the data and to discuss the results among the peers. |
| Course Schedule | Class meets every week starting October 2014. Research topics to be discussed will be derived from the following topics: Molecular Biology of Gene Expression, Advance in Biochemistry, Structure Biology and Chemical Biology. |
| Homework | |
| Grading Methods and Criteria | Students are evaluated based on their active participation, clarity of the presentation, discussion, and the quality of their report submitted. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Students are required to read the papers assigned for discussion. Students will prepare a written report for each topics discussed. |
| Textbook: | Research articles to be discussed for each class will be provided as a PDF files. |
| Room Number | To be announced |
| Notes | |
| Keywords | |

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| Course | International Discussion on Human Biology I |
| Course No. | 02RA090 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprABC Fri1,2 |
| Instructor | Kenji Irie, Ryosuke Ohniwa |
| Course Overview | Focusing on molecular biology of the cell, International Discussion on Human Biology I provides the opportunities for the students to have interactive online distance learning with the National Taiwan Univesrity and Kyoto Univesrity, and to engage in thesis presentation and discussion conducted in English. In this course, the students should be able to understand basic knowledge of life sciences and acquire scientific communication skills in English. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures and class e |
| Outline | Focusing on molecular biology of the cell, International discussion on human biology I provides the opportunities for the students to have interactive online distance learning with the National Taiwan University and the Kyoto University, and to be engaged in thesis presentation and discussion conducted in English. In this course, the students should be able to understand basic knowledge of life sciences and acquire scientific communication skills in English. |
| GIO (General Instructional Objective) | Boosting scientific communication in English, exploring biological sciences, and promoting international long-distance academic and research exchanges. |
| SBO (Specific Behavioral Objectives) | Boosting scientific communication in English, exploring biological sciences. |
| Course Schedule | Spring 2016 10:30AM-12:00PM (9:30AM-11:00AM Taipei Time) 1.2/26 NTU Faculties Course organization in NTU 2.3/4 (No class in KU, UT) 3.3/11 (No class in KU, UT) 4.3/18 (No class in KU, UT) 5.3/25 (No class in KU, UT) 6.4/1 (No class in NTU) 7.4/8 Kunio Takeyatu Course organization/ Microscopy and Central dogma 8.4/15 Feng-Ting Huang Transcription 9.4/22 Tadashi Uemura Protein conformation, dynamics and enzymology 10.4/29 (No class in KU) 11.5/6 Chia-Ying Chu Regulation of gene expression — Small RNA mediated gene silencing in animals 12.5/13 Jeff Lee Signaling transduction 13.5/20 Chun-Che Chang Cellular responses and adaptation to environmental factors (I) — Development |

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| | <p>14.5/27 Mineko Kengaku Cellular responses and adaptation to environmental factors (II) — Cell migration</p> <p>15.6/3 Shin Yonehara Cellular responses and adaptation to environmental factors (III) — Cell death</p> <p>16.6/10 No class in NTU (Holiday)</p> <p>17.6/17 Akira Kakizuka Regulation of gene expression (I) — Transcriptional controls</p> <p>18.6/24 Paper presentation in Tsukuba</p> <p>19.7/1 Paper presentation in Tsukuba</p> <p>20.7/11 (No class in NTU)</p> |
| Homework | |
| Grading Methods and Criteria | (Graduate students): Attendance (70%), Presentation (30%) |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | |
| Textbook: | Molecular Cell Biology by Lodish et al (6th edition) (Freeman) |
| Room Number | Health and Medical Science Innovation Laboratory, Meeting Room 105 |
| Notes | <p>Lecture and discussion will be held in English.</p> <p>Download the materials from the course webpage: TBA</p> |
| Keywords | |

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| Course | International Discussion on Human Biology II |
| Course No. | 02RA100 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallABC Wed1,2 |
| Instructor | Kenji Irie, Ryosuke Ohniwa |
| Course Overview | Focusing on cancer biology, International Discussion on Human Biology II provides opportunities for the students to have interactive online distance learning with the National Taiwan University and Kyoto University, and to engage in thesis presentation and discussion conducted in English. In this course, the students should be able to understand basic knowledge of life sciences and acquire scientific communication skills in English. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures and class e |
| Outline | Focusing on molecular biology of the cell, International discussion on human biology I provides the opportunities for the students to have interactive online distance learning with the National Taiwan University and the Kyoto University, and to be engaged in thesis presentation and discussion conducted in English. In this course, the students should be able to understand basic knowledge of life sciences and acquire scientific communication skills in English. |
| GIO (General Instructional Objective) | Boosting scientific communication in English, exploring biological sciences, and promoting international long-distance academic and research exchanges |
| SBO (Specific Behavioral Objectives) | Boosting scientific communication in English, exploring biological sciences. |
| Course Schedule | To be announced |
| Homework | |
| Grading Methods and Criteria | Class attendance and participation, presentation and discussion. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | Cancer Biology |
| Room Number | Health and Medical Science Innovation Laboratory, Meeting Room 105 |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Research Presentation and Discussion |
| Course No. | 02RA101 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC Wed2 |
| Instructor | Hiroyuki Suzuki |
| Course Overview | In this course, every student will make a presentation in English about their own research plan and achievements. In addition, students can examine the world situation of relevant fields and discuss in English results published in English that are broadly related to human biology. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | Invited speakers and students give presentation about their research and discuss them in English |
| GIO (General Instructional Objective) | To understand the broad fields of research and to discuss them in English. To learn how to give a good presentation in English |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to give a presentation about your own research objectives, methods, results and future directions in English 2. To be able to explain the worldwide location and creativity of your own research in English 3. To be able to understand the questions from audience and discuss them in English 4. To be able to understand the contents, significance and weak points of presentations from other speakers. 5. To be able to discuss the contents, significance and weak points of presentations from other speakers in English. |
| Course Schedule | First Class: Wednesday 16 April 2014 |
| Homework | Improve the ability of English communication by active discussion and communication with each other. |
| Grading Methods and Criteria | Students are evaluated by the points listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | Medical Sciences Building, Room 305 |
| Notes | |
| Keywords | |

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| Course | Home Internship (Omics Analysis) |
| Course No. | 02RA102 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC by appointment |
| Instructor | Takaaki Sato |
| Course Overview | Home Internship engages the students in on-campus internships. Attending laboratory activities led by researchers working at business companies, the students should be able to understand research principles in business circles, and understand a variety of research approaches regarding recent social needs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | In this Home Internship Course, the students will study the advanced laboratory experiments in proteomics & metabolomics. The students will also understand basic analytical principles so they can apply them to proteomics & metabolomics profiling. This course will focus on practical applications for proteomic research by Mass Spectrometry, so the students are guided to design better and successful experiments and to more easily interpret the resulting data. |
| GIO (General Instructional Objective) | To understand the successful experimental design of proteomics and metabolomics analysis and to interpret the resulting data by advanced analytical instrument including Mass Spectrometry. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the aims and objectives of proteomics & metabolomics research and the principal of analytical instruments including Mass Spectrometry. 2. To be able to explain the cutting-edge technologies and solutions of the advanced molecular analytical instruments. 3. To be able to prepare the cell extracts from cell lines and tissue samples. 4. To be able to experiment electrophoretic techniques as isoelectric focusing, SDS page, 2-D page. 5. To be able to experiment liquid-chromatography techniques, such as ion exchange, affinity chromatography and reversed-phase HPLC. 6. To be able to utilize the advanced molecular analytical instruments including Mass Spectrometry. 7. To be able to interpret the experimental data including Mass Spectrometry profiling. 8. To be able to make an experimental report (Introduction, Material & Methods, Experimental Results, Discussions, References) and to design future experiments. |

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| Course Schedule | <ol style="list-style-type: none"> 1.Introduction of general proteomics & metabolomics research 2.Introduction of Mass Spectrometry (MS) 3.Introduction of preparation of samples for proteomics & metabolomics research. 4.Application of Mass Spectrometry (proteome) 5.Application of Mass Spectrometry (metabolome) 6.Application of Mass Spectrometry (genome) 7.Application of Mass Spectrometry (MS imaging) 8.Interpretation of Mass Spectrometry profiling data 9.Preparation of an experimental report and future experimental design |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the scientific and experimental quality of the proteomics & metabolomics data, its interpretation and discussion in the experimental course, and their qualifications are determined by accomplishment of the original research projects. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Attend the course of Analysis of Machineries in Human Biology. The textbook and general proteomics analysis notes will be announced. |
| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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| Course | Home Internship (Integrative Physiology) |
| Course No. | 02RA103 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC by appointment |
| Instructor | Yukihiro Yada |
| Course Overview | Home Internship engages the students in on-campus internships. Attending laboratory activities led by researchers working at business companies, the students should be able to understand research principles in business circles, and understand a variety of research approaches regarding recent social needs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | Integrative physiology is very valid learning to understand the functional changes in our body. We are based on the integrated physiological investigations of such ideas, looking at proposed health care worth a new perspective. Particularly, in this curriculum(lecture and training), you will study the physiological function (i.e., sedative effect) of aroma components. We hope that you will successfully build up robust professional captaincy with strong leadership to accomplish the task. |
| GIO (General Instructional Objective) | To understand the integrative physiology, morphological examinations and to learn strategies to obtain the knowledge and the important measurement techniques of autonomic nervous system and central nervous system . |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to study the general knowledge of functional physiology, i.e., the autonomic nervous system (the sympathetic and the parasympathetic nervous system), and central nervous system, 2. To be able to study the newest analytic technologies for autonomic nervous system of human body, i.e., heart rate variability analysis, blood pressure change analysis, pupil analysis (miosis) and pulse wave analysis, 3. To be able to study the newest analytic technologies for central nervous system of human brain, i.e., NIRS(=Near Infra-red Spectroscopy), fMRI(=functional magnetic resonance imaging) , 4. To be able to study the physiological function of aroma components, particularly, the interesting function and new mechanism of cedrol(contained in cedar wood oil) 5. To be able to study the important analytic technologies for stress-related hormones in human saliva, i.e., cortisol, amylase and clomogranin A, 6. To be able to master the experimental methods for integrative evaluation of natural aroma component, i.e., measurement of miosis, continuous blood pressure, NIRS and cortisol |
| Course Schedule | 1.Introduction to research and development of Kao Corporation |

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| | <p>2.Introduction to integrative physiology</p> <p>3.Autonomic nervous system and the measuring method</p> <p>4.Central nervous system and the measuring method</p> <p>5.Introduction of cedrol and the physiological function</p> <p>6.Explanation the physiological experiment of aroma components</p> |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by percentage of attendance (50%) and experimental reports (50%). |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | |
| Textbook: | <p>Use original notes(for textbooks), papers(for research of cedrol) and manual of measuring instruments.</p> <p>References</p> <ol style="list-style-type: none"> 1. Yamamoto, Y.: The effects of cedrol on sleep. (2003) J Jpn Physiol Anthropol, 8, 2, 69-74 2. Dayawansa, S., et al.: Autonomic responses during inhalation of natural fragrance of “ Cedrol ” in humans. (2003) Auton Neurosci: Basic and Clinical, 108, 79-86 3. Dayawansa, S. et al. : Autonomic responses during inhalation of natural fragrance of cedrol in human. (2005) J Jpn Soc Aroma, 4, 17-21 4.Hirose K, : Effects of cedrol treatment as a complementary therapy on sleep disorder and symptoms in menopause. J Jpn Menopause Soc, 14, 2, 225-231(2006) 5. Akutsu T, et al.: Effect f the natural fragrance “ cedrol ” on dopamine metabolism in the lateral hypothalamic area of restrained rats: A microdialysis study. (2006) International Congress Series, 1287, 195-200 6. Yada Y, et al.: Overseas survey of the effect of cedrol on the autonomic nervous system in three countries. (2007) J Physiol Anthropol, 26, 349-354 7. Sadachi H, et al.: Effect of cedrol on the autonomic nervous system in USA. (2007) Jpn Cosme Sci Society, 31, 3, 148-152 8. Umeno K, et al. : Effects of direct cedrol inhalation into the lower airway on autonomic nervous activity in totally laryngectomized subjects. (2007) Br J Clin Pharmacol, 65, 2, 188-196. |

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| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | <p>Students will be divided some groups (3~4 persons per one group) to evaluate the physiological effect of aroma components.</p> <p>Each group suitably choices an aroma component, and all members cooperatively evaluate the effect of aroma.</p> <p>Maker ' s engineers of measuring instruments (for measurement of miosis, NIRS, blood pressure and cortisol) will kindly support your experiment.</p> <p>Students individually have to submit an experimental report within at least one month</p> |
| Keywords | |

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| Course | Introduction to Appropriate Technology |
| Course No. | 02RA110 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprC Intensive |
| Instructor | Kenji Irie |
| Course Overview | Through a series of lectures and discussions, Introduction to Appropriate Technology provides opportunities for the students to gain the basic knowledge required for studying a wide range of appropriate technology subjects, such as appropriate technology training, current social circumstances in developing countries, and field activities. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures and class e |
| Outline | <p>Through lecture and discussion series, Introduction for appropriate technology provides the opportunities for the students to gain basic knowledge required for studying a wide range of appropriate technology subjects, such as appropriate technology training, current social circumstances in developing countries, field activities, and so forth.</p> <p>What is Introduction for Appropriate Technology?</p> <p>The world population pyramid indicates that those who with annual income below 3,000 dollars are regarded as the phase of Base of the Pyramid (BOP). In the world today, BOP Business which ensures sustainable business strategies should be a potential market for the phase of BOP to buy products or services at affordable price and to improve their quality of life. With regards to local cultures, social customs, and environments of targeted communities in developing countries, ' Appropriate Technology ' addresses the technology design regarding appropriate functions and prices. Through a series of lectures and discussions led by the lecturer, Introduction for Appropriate Technology provides opportunities for the students to acquire basic knowledge of appropriate technology subjects, such as appropriate technology training, current social circumstances in developing countries, and field activities. Focusing on the targeted BOP market which truly needs the particular products in the world, Appropriate Technology, an advanced course of Introduction for Appropriate Technology, further engages the students to incorporate their existing fieldwork into the appropriate technology design in terms of local cultures, customs, and environments, and develop the products with sustainable business strategies afterward.</p> |

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| GIO (General Instructional Objective) | To gain basic knowledge required for studying a wide range of appropriate technology subjects, such as appropriate technology training, current social circumstances in developing countries, field activities, and so forth. |
| SBO (Specific Behavioral Objectives) | To gain basic knowledge required for studying a wide range of appropriate technology subjects, such as appropriate technology training, current social circumstances in developing countries, field activities, and so forth. |
| Course Schedule | TBA |
| Homework | |
| Grading Methods and Criteria | Class attendance and participation, report |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | TBA |
| Notes | Classroom: Auditorium, 8th Floor, Health and Medical Science Innovation Laboratory building, Medical Area |
| Keywords | |

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|---------------------------------------|--|
| Course | International research rotation |
| Course No. | 02RA111 |
| Credits | 5.0Credits |
| Grade | 2Year |
| Timetable | FallABC by request |
| Instructor | Mitsuyasu Kato |
| Course Overview | This course offers the students the opportunity to select one or two laboratories that they are interested in from those hosted by the faculty members of the Ph.D. Program in Human Biology. The students will then engage in their own research in the laboratories for 1-2 months and discuss with their instructors its objectives, procedures and results. In this course, they should be able to acquire a wide range of research techniques and develop their skills for analysis of research results and get an international mindset. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | Researches require experimental techniques and abilities to accomplish experiments, precisely analyze experimental results, and minutely discuss with the international leading scientists. This course offers the students the opportunities to acquire experimental techniques and abilities described above by performing researches in one or two laboratories, in which the students are interested, for 1-2 months under the supervision of the faculty members of the Ph.D. Program in Human Biology. |
| GIO (General Instructional Objective) | To acquire a wide variety of experimental techniques. To understand the aim of specific researches. To discuss with supervisors on the obtained results and how to advance researches. To cultivate internationality and acquire an ability to precisely analyze the obtained results. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the aim of specific researches that the students performed, 2. To be able to explain the experimental results that the students obtained, 3. To be able to explain the detail of experimental techniques that the students learned. 4. To be able to discuss on the experimental results that the students obtained. |
| Course Schedule | Select 1~2 laboratories, in which the students are interested, from those presided by the faculty members in the Ph.D. Program in Human Biology, and negotiate with the supervisors when the students can perform their experiments. Perform experiments for 1-2 months. |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the reports of their researches based on the knowledge listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |

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| Assignment | Read manuscripts related to the specific researches that the students perform. Discuss the experimental results and how to advance researches with laboratory members as well as supervisors. |
| Textbook: | |
| Room Number | Laboratory of each professor |
| Notes | To be announced if any. |
| Keywords | |

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|---------------------------------------|---|
| Course | Internship in Overseas Companies |
| Course No. | 02RA112 |
| Credits | 5.0Credits |
| Grade | 2Year |
| Timetable | FallABC by request |
| Instructor | Akira Shibuya |
| Course Overview | In this course, the students are expected to find a possible overseas company for internship and work on-site |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | An international internship is approved for on-the-job work experience where scientific knowledge obtained from classes is integrated with actual practical work experiences. Internships provide you with knowledge of career opportunities, help students gain an understanding of the roles on basic and translational research plays in today ' s business environment, and how one might better prepare to be a successful part of the profession. |
| GIO (General Instructional Objective) | To learn through experience the role of basic and translational research in business. |
| SBO (Specific Behavioral Objectives) | 1 . To be able to explore and obtain information on career opportunities, 2 . To be able to network with professionals and identify possible collaborators, 3 .To be able to return with experiences that will enrich future course work |
| Course Schedule | Assignment: |
| Homework | |
| Grading Methods and Criteria | Your internship provider has an opportunity to evaluate you. Students are evaluated by the reports of your hosts based on your activities. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Appropriate Technology |
| Course No. | 02RA113 |
| Credits | 5.0Credits |
| Grade | 2Year |
| Timetable | FallABC by request |
| Instructor | Kenji Irie |
| Course Overview | In terms of local needs, cultures, environments, and people, Appropriate Technology provides opportunities for the students to develop the optimum technology needed for targeted communities and to generate problem-solving skills, improvisational capabilities, and entrepreneurial abilities for future social needs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | In terms of local needs, cultures, environments, and people, Appropriate Technology, provides opportunities for the students to develop the optimum technology needed for targeted communities and to generate problem-solving skills, improvisational capabilities, and entrepreneurial abilities for future social needs. |
| GIO (General Instructional Objective) | To develop the optimum technology needed for targeted communities and to generate problem-solving skills, improvisational capabilities, and entrepreneurial abilities for future social needs. |
| SBO (Specific Behavioral Objectives) | To develop the optimum technology needed for targeted communities and to generate problem-solving skills, improvisational capabilities, and entrepreneurial abilities for future social needs. |
| Course Schedule | June: Guidance July-September: Field trip to local communities to find local needs (at least 1 week) September-December: Develop the optimum technology needed for targeted communities December: Presentation of the optimum technology and a business plan with the technology |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by Grading Criteria as follows: |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | To be announced |
| Notes | Students have to take a subject " Introduction for appropriate technology ", before taking this subject. Students have to apply the HBP travel grant for filed trip. |

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| Course | Entrepreneurship Training |
| Course No. | 02RA114 |
| Credits | 5.0Credits |
| Grade | 2Year |
| Timetable | FallAB Intensive |
| Instructor | Yoshinori Harada, Osamu Ohneda |
| Course Overview | Entrepreneurship Training aims to lead the students to nurture the mindset and skill required for application of their technical seeds and ideas to society. Invited lecturers who have successfully started their own business will instruct the students to understand ideas and skills from the standpoints of social needs, entrepreneurial activities, and business continuity. In addition, the students will study project management skills, success and failure cases in business. |
| Remarks | Lectures are conducted in English. 10/20,10/27-12/8,12/8-12/22 |
| Course Type | class exercises |
| Outline | Students learn the structure of life science business. Students learn the business minds and skills required in practical application of seeds technologies and ideas produced in basic researches to the industry and society. Students also learn knowhow and skills for project management, catching social needs, foundation of enterprise, continuation of business, through lectures and seminars by experts and veterans of entrepreneurship. Students plan/simulate inauguration of bio-ventures based on their own research themes or ideas. Success cases and failure cases will be used as teaching materials. |
| GIO (General Instructional Objective) | To learn basic knowhow and skills for the inauguration of venture/enterprise and continuation of business as fruits of basic researches. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain fundamental process for creation/inauguration of life science business, 2. To be able to simulate a creation of enterprise (business model) by using specific research themes and/or ideas. |
| Course Schedule | 1.Objective and goal of the “ Entrepreneurship Training ”, overview of life science business, basic knowledge on business start-up (Oct. 20) 2.Visit companies, lectures on reality, history and trend of biotechnology industry and bio-venture(s), analysis of success cases and failure cases Undecided(Oct.27-Dec.8) 3.Visit companies, lecture on skills for bio-business start-up, reality of researches in big pharma, creation of novel business in established industry, global trends in bio-industry in case of global pharmaceutical industry Undecided(Oct.27-Dec.8) 4.Lecture on creation, application, maintenance and usage of intellectual properties(patents) Undecided(Oct.27-Dec.8) 5.Lecture on skills for starting business (social needs, marketing, business model, financial issue etc.) Undecided(Oct.27-Dec.8) 6.Lecture on basic skills of project management(case studies in project management, Innovation management, human resource management(including coaching skills and practice of coaching), communication and presentation skills) Undecided(Oct.27-Dec.8) |

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| | <p>7.Funding sources, tools for planning</p> <p>8.Group discussion and simulation of (small) bio-business Undecided (Dec.8-Dec.22)</p> <p>9.Preparation business model documents and presentation materials Undecided (Dec.8-Dec.22)</p> <p>10.Presentation of business model and discussion (peer review) (Dec. 22)</p> <p>11.Revision of proposal (Dec. 22)</p> <p>12.Revised presentation of business model and discussion (Dec. 22)</p> <p>13.Awarding excellent proposals (Dec. 22)</p> <p>14.(Off-campus classes) Visit of company institutes</p> |
| Homework | Preparation business model documents and presentation materials |
| Grading Methods and Criteria | Students are evaluated by contribution to simulate business models in group works (50%), and quality of business model document and presentation skill (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Read textbooks and activate discussion out of classes. |
| Textbook: | <p>SCIENCE BUSINESS The promise, The reality, and the future of biotech. Gary P. Pisano</p> <p>Additional handouts will be provided by the teachers and advisors</p> |
| Room Number | To be announced |
| Notes | |
| Keywords | |

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| Course | Advanced International Research Rotation |
| Course No. | 02RA115 |
| Credits | 10.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by request |
| Instructor | Mitsuyasu Kato |
| Course Overview | This course offers the students the opportunity to select one or two overseas laboratories that they are interested from those hosted by the faculty members in Ph.D. Program in Human Biology and conduct research there for 6-18 months. The students will then proceed with the writing of their doctoral dissertation during their research period and discuss with their instructors the objectives, procedures, results and future policy of their research. In this course, they should be able to acquire abilities to conduct and guide research and develop professional research skills and an international mindset. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Researches require experimental techniques and abilities to accomplish experiments, precisely analyze experimental results, advance researches and minutely discuss with the international leading scientists. This course offers the students the opportunities to acquire abilities to design and conduct researches and develop doctoral thesis researches by performing researches in a laboratory, in which the students are interested, for 6~18 months under the supervision of the faculty members of the Ph.D. Program in Human Biology. |
| GIO (General Instructional Objective) | To acquire the abilities how to advance researches and how to instruct students in advancement of researches. To discuss the obtained results and how to advance researches with supervisors. To cultivate the internationality and acquire an ability to develop professional researches and of internationality. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the aim of special researches that the students performed, 2. To be able to explain the experimental results that the students obtained, 3. To be able to discuss how to advance researches with leading scientists, 4. To be able to present data at scientific meetings. |
| Course Schedule | Select specific laboratories that the students are interested in from those presided by the faculty members in the Ph.D. Program in Human Biology, and negotiate with the supervisors when the students perform their experiments. Perform experiments for 6~18 months. |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the supervisors based on the abilities listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | Read manuscripts related to the specific researches that the students perform. Discuss the experimental results and how to advance researches with laboratory members as well as supervisors. Present at the scientific meetings. |
| Textbook: | |
| Room Number | Laboratory of each professor |
| Notes | |
| Keywords | |

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|---------------------------------------|--|
| Course | Advanced Internship in Overseas Companies |
| Course No. | 02RA116 |
| Credits | 10.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by request |
| Instructor | Akira Shibuya |
| Course Overview | In this course, the students are expected to negotiate with an overseas company for the internship's design and plan, and implement the plan. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | An advanced international internship is approved for on-the-job work experience where scientific knowledge obtained from classes is integrated with actual practical work experiences. Internships provide you with knowledge of career opportunities, help students gain an understanding of the roles on advanced and translational research plays in today 's business environment, and how one might better prepare to be a successful part of the profession. |
| GIO (General Instructional Objective) | |
| SBO (Specific Behavioral Objectives) | To learn through experience the role of advanced and translational research in business. |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | Your internship provider has an opportunity to evaluate you. Students are evaluated by the reports of your hosts based on your activities. |
| Grading Criteria | S: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | explore,obtain,career,opportunities,professionals,identify,collaborators,able,return,experiences,t |

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|---------------------------------------|---|
| Course | Advanced Appropriate Technology |
| Course No. | 02RA117 |
| Credits | 10.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by appointment |
| Instructor | Kenji Irie |
| Course Overview | Based on practical skills obtained from the Appropriate Technology course, Advanced Appropriate Technology further aims to lead the students to conduct field experiments and address technological developments for starting a new business in targeted communities. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | Based on practical skills obtained from Appropriate Technology, Advanced Appropriate Technology further aims to lead the students to conduct field experiments and address technological developments for starting a new business in targeted communities. |
| GIO (General Instructional Objective) | To be announced |
| SBO (Specific Behavioral Objectives) | In terms of local needs, cultures, environments, and people, Advanced Appropriate Technology provides opportunities for the students to develop the optimum technology needed for targeted communities and to generate problem-solving skills, improvisational capabilities, and entrepreneurial abilities for future social needs. |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | The students shall be evaluated in accordance with the following grading criteria. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | The students have to take " Introduction for Appropriate Technology " and " Appropriate Technology, " before taking this subject. The students have to apply for the HBP travel grant for attending field trips. |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | terms,local,needs,cultures,and,advanced,appropriate,provides,opportunities,develop,optimum,te |

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| Course | Advanced Entrepreneurship Practice |
| Course No. | 02RA118 |
| Credits | 10.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual Intensive |
| Instructor | Yoshinori Harada |
| Course Overview | Advanced Entrepreneurship Practice is designed for the students who have completed Entrepreneurship Training to learn the basic mindset and skills required for application of their technical seeds and ideas to society. With the support of advisors, the students will develop proposals and practical scenarios (scripts) to start and sustain new business with regards to existing research subjects. Projects that attract entrepreneurial funding will be launched as bio-ventures. |
| Remarks | Lectures are conducted in English. 10/20,10/27-12/8,12/8-2/15 |
| Course Type | lab works, practical |
| Outline | Students simulate/plan foundation of biotechnology industry based on their own research themes or on the seeds provided from the University of Tsukuba. Students learn practical processes of inauguration novel business and its maintenance under supervision of advisers who have experiences of creation of bio-ventures and/or innovative businesses in existing life science industries. After intensive feasibility studies, projects getting funds (financial supports) will be launched as bio-ventures. |
| GIO (General Instructional Objective) | To plan pragmatic/practical process for inauguration of enterprise and continuation of life science business |
| SBO (Specific Behavioral Objectives) | Contacts with potential business partners are recommended. |
| Course Schedule | <ol style="list-style-type: none"> 1. Overview of global life science business Oct. 20 2. Lecture on structure of biotechnology industry Undecided(Oct.27-Dec.8) 3. Lecture on intellectual properties Undecided(Oct.27-Dec.8) 4. Lecture on social needs, marketing, business model, financial issue etc. Undecided(Oct.27-Dec.8) 5. Seeds discovery practice Undecided(Oct.27-Dec.8) 6. Marketing realistic social needs on site Undecided(Oct.27-Dec.8)Planning of bio-business (Group work) Undecided(Oct.27-Dec.8) 7. Preparation business model documents and presentation document Undecided(Oct.27-Dec.8) 8. Presentation of business model and peer review Undecided(Oct.27-Dec.8) 9. Revision of business models and plans (Group work) Undecided(Oct.27-Dec.8) 10. Feasibility studies or hearing (Group work) Undecided(Oct.27-Dec.8) 11. Presentation of business models and plans to potential investors or to potential business partners Dec.8 12. Participation to the external business model competition or application to start-up funding (Dec.8-Feb.15) 13. Trial of fund raising (Dec.8-Feb.15) |

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| Homework | |
| Grading Methods and Criteria | Students are evaluated by contribution to simulate business models in group works (50%), and feasibility of business plans (50%) approved by external organizations. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read textbooks and activate discussion out of classes. Contacts with potential business partners are recommended. |
| Textbook: | Additional handouts will be provided by the teachers and advisors |
| Room Number | |
| Notes | |
| Keywords | pragmatic/practical,inauguration,enterprise,and,continuation,life,science,present,plans,able,get, |

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| Course | Strategic Design on Career of Ph.D. |
| Course No. | 02RA119 |
| Credits | 1.0Credits |
| Grade | 4Year |
| Timetable | SprAB by appointment |
| Instructor | Mitsuru Okuwaki, Hiroya Igarashi |
| Course Overview | This subject provides lectures and workshops related to career development, team/project management, business communication skills, and social manners as a tool for innovation. Those knowledge and literacy are necessary for the students to participate actively and successfully in the international community. Upon completion of the course, students are ready to attend internships to pursue their career after graduation. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | This subject provides lectures and workshops related to career development, project management, business communication skills, and design thinking as a tool for innovation. Those knowledge and literacy are necessary for the students to participate actively and successfully in the international community. Upon completion of the course, students are ready to attend internships to pursue their career after graduation. |
| GIO (General Instructional Objective) | To acquire practical knowledge necessary as a social person to success in the international community. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain your own ideas about leadership. 2. To be able to explain about project management. 3. To be able to make action plans to improve yourself for career development. 4. Spread own framework of knowledge. |
| Course Schedule | <p>1.Orientation / Strategic Design of Ph.D. Hiroya Igarashi</p> <p>2.Outline of project management Hiroya Igarashi</p> <p>3.To be an outstanding business person Hiroya Igarashi</p> <p>4.Fundamental method for business communication Hiroya Igarashi</p> <p>5.Innovation through Design Thinking Hiroya Igarashi</p> |
| Homework | To be announced if any |
| Grading Methods and Criteria | Class participation 30% Report 70% |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | Submission of report: Details will be announced upon the beginning of the subject. |
| Textbook: | N/A |
| Room Number | Room 106, Tsukuba Industrial Liaison and Cooperative Research Center |
| Notes | This subject contains a part of a graduate general education course “ Career path for PhDs ” in Japanese language. Therefore, students who have obtained a credit from “ Career path for PhDs ” course cannot obtain a credit from this subject. The credit of this subject is indispensable to attend internships organized by Network for Developing Global Leader Career “ GLCNet ” in University of Tsukuba. |
| Keywords | |

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| Course | Human Anatomy and Embryology |
| Course No. | 02RA120 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | FallAB Mon3,4 |
| Instructor | Satoru Takahashi, Hisashi Oishi |
| Course Overview | Human Anatomy and Embryology engages the students in the developmental program of human beings. The students will learn how human beings are organisms and how the bodies of human beings consist of cells, tissues, vital organs, and internal organs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Human anatomy, which is the study of the structure of the entire human body and its relation to function, is an essential part of many novel and emerging interdisciplinary fields in science. First part of the course regarding anatomy provides international students with simplified and integrative essence of gross anatomy using adequate presentation-slides containing a number of images. Second part of the course focuses on fundamental knowledge on embryology to help comprehensive understanding of recent advances in technologies, including regenerative medicine, tissue engineering, and reproductive technology. |
| GIO (General Instructional Objective) | The primary goal of the course is to provide students with a broad understanding of the gross anatomy and embryology of the entire human body. This knowledge serves as a foundation for research abilities in medicine and life science. In addition, this course prepares students to apply anatomy and embryology concepts to better insight into the pathophysiology of disease processes. |
| SBO (Specific Behavioral Objectives) | At the end of this course, students should be able to: <ol style="list-style-type: none"> 1. Define the anatomical positions and planes, use them correctly, and develop a positive approach-to the subject. 2. Describe the course of the ascending aorta, the arch of the aorta and the descending thoracic aorta. Name their major branches and the structures they supply. 3. Explain the thoracic, abdomen, and pelvis cavities and the viscera they contain. 4. Describe the major joints of the body, their movements and the muscles producing these movements. 5. Describe the type of tissues derived from the three embryonic germ layers. 6. Explain the different stages of human development. 7. Explain the molecular regulation of cardiac development. 8. Describe the process of neurulation and include definitions for the terms neural folds, neural tubes, and neural tube closure. 9. Explain the reason why the third to eighth weeks of embryogenesis are so important for normal development and the most sensitive for induction of structural defects |

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| Course Schedule | 1-5; Anatomy, 6-10: Embryology 1.Introduction to Anatomy 2.Thorax 3.Abdomen 4.Pelvis and Perineum 5.Head 6.General Embryology (1) 7.General Embryology (2) 8.Cardiovascular and Respiratory Systems 9.Digestive and Urogenital Systems 10.Head and Neck, Central Nervous Systems |
| Homework | |
| Grading Methods and Criteria | All students are evaluated by class attendance and participation (50%) and report to evaluate the knowledge listed in the SBO. The report title is provided at the end of the course (50%) |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Skimming textbooks. |
| Textbook: | 1. Langman ' s Medical Embryology 12th edition, Sadler, Lippincott Williams & Wilkins, 2011 2. Essentials of Anatomy and Physiology 9th edition, Tortora, John Wiley & Sons, 2013 |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | The lecture is not intended to present all information; students are expected to study information in the assigned textbook to supplement material presented in the lectures. |
| Keywords | |

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| Course | Human Pathology and Oncology |
| Course No. | 02RA121 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | SprBC Wed5,6 |
| Instructor | Mitsuyasu Kato |
| Course Overview | Human Pathology and Oncology provides opportunities for the students to learn about the basic disease entities of circulatory disorders (i.e., edema, thrombosis, and infarction), inflammation, and neoplasia, in terms of the causes, pathogenesis, and morphological changes of human diseases. Examining pathological specimen of common diseases, the students should be able to understand various human in vivo phenomena. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Human Pathology and Oncology provides opportunities for the students to learn about the basic disease entities of circulatory disorders (i.e., edema, thrombosis, and infarction), inflammation, and neoplasia, in terms of the causes, pathogenesis, and morphological changes of human diseases. Examining pathological specimen of common diseases, the students should be able to understand various human in vivo phenomena. |
| GIO (General Instructional Objective) | To understand the structural, biochemical, and functional changes in cells, tissues, and organs that underlie human disease. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain common circulatory disorders (hemorrhage, thrombosis, embolism, infarction, edema and shock), 2. To be able to explain the definition, classification, morphological changes, and time course of inflammation, 3. To be able to explain the process and a variation of cell injury and death, 4. To be able to explain the process of tissue repair and adaptation (atrophy, hypertrophy, hyperplasia and metaplasia), 5. To be able to explain the definition of benign and malignant neoplasm and cancer, 6. To be able to explain the local growth and metastasis of cancer, 7. To be able to explain the clinical staging of cancer, 8. To be able to explain the function of major oncogenes and tumor suppressor genes, 9. To be able to explain the major cancer and related disorders in each tissues and organs, 10. To be able to explain current status of cancer epidemiology, treatment and prevention. |

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| Course Schedule | <p>1.2016/5/25(Wed) Kato M Introduction to Pathology</p> <p>2.2016/5/25(Wed) Kato M Tissue Homeostasis and Regeneration</p> <p>3.2016/6/1 (Wed) Suzuki H Cell Injury and Death</p> <p>4.2016/6/1 (Wed) Suzuki H Degeneration, Hyperplasia and Hypertrophy</p> <p>5.2016/6/8 (Wed) Kato M Circulatory Disturbance I</p> <p>6.2016/6/8 (Wed) Kato M Circulatory Disturbance II</p> <p>7.2016/6/15 (Wed) Kato M Inflammation I</p> <p>8.2016/6/15 (Wed) Kato M Inflammation II</p> <p>9.2016/6/22 (Wed) Suzuki H Oncogenes</p> <p>10.2016/6/22 (Wed) Suzuki H Tumor Suppressor Genes</p> <p>11.2016/6/29 (Wed) Watanabe Y Hallmarks of Cancer</p> <p>12.2016/6/29 (Wed) Okita M Invasion and Metastasis</p> <p>13.2016/7/6 (Wed) Noguchi M Diagnostic Pathology</p> <p>14.2016/7/6 (Wed) Noguchi M Lung Cancer</p> <p>15.2016/7/13 (Wed) Oda T Gastric Cancer and Colorectal Cancer</p> <p>16.2016/7/13 (Wed) Oda T Pancreatic Cancer and Hepatocellular carcinoma</p> <p>17.2016/7/20 (Wed) Kawai K Cancers in Kidneys, Bladder, and Prostate</p> <p>18.2016/7/20 (Wed) Sakamoto N Brain Tumor</p> <p>19.2016/7/27 (Wed) Minaguchi T Cancers in Female Reproductive Organs</p> <p>20.2016/7/27 (Wed) Chiba S Leukemia and Related Disorders</p> |
| Homework | <p>Read textbook.</p> <p>Study histopathology by virtual slides.</p> |
| Grading Methods and Criteria | <p>The students are evaluated by the short tests after each lectures (50%) and an end-of-term report (50%).</p> |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | |
| Textbook: | Robbins and Cotran, Pathologic Basis of Disease 8th edition. Kumar, Abbas, Fausto and Aster ed., Saunders, 2010. |
| Room Number | Room 119, 4B Building, Medica Area |
| Notes | |
| Keywords | |

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| Course | Human Infection and Immunology |
| Course No. | 02RA122 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | SprAB Mon3,4 |
| Instructor | Akira Shibuya |
| Course Overview | Human Infection and Immunology provides the opportunity for the students to understand infectious diseases through interrelationships between pathogenic microbes and human beings, and study roles of immune systems. The roles of immune systems are to protect the human body from infectious disease. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | To understand infection biology and immunology is the basis to develop a strategy for control of infectious diseases all over the world. In this course, students study the molecular mechanism of replication and pathogenicity of infectious microbes such as viruses and bacteria, and the structure and function of microbes-encoded factors and host cell-derived factors involved in the replication and pathogenicity. In addition, students also study the immune system, including adaptive and innate immunities, which is crucial for human health and survival. |
| GIO (General Instructional Objective) | To understand the nature of infectious microbes such as bacteria and viruses, the host immune system, and the molecular interface between infectious microbes and host immunity. Based on the basic knowledge, students aim to obtain ability to develop a strategy for control of human infectious diseases. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the biological characteristics of bacteria 2. To be able to explain the properties of pathogenic and non-pathogenic bacteria 3. To be able to explain the mechanism and regulation of bacterial pathogenicity 4. To be able to explain the control of Infectious disease, antimicrobials, and drug resistance 5. To be able to explain the replication mechanism of parasites & fungi 6. To be able to explain the molecular pathogenesis of parasites & fungi 7. To be able to explain the molecular basis of virus genome replication 8. To be able to explain the molecular pathogenesis of viruses 9. To be able to explain the outline of virus engineering 10. To be able to explain the control mechanism & strategy for viruses 11. To be able to explain the cells and tissues of the immune system. 12. To be able to explain the structure and function of antibodies. 13. To be able to explain lymphocyte development and antigen receptor gene rearrangement. 14. To be able to explain the innate immune system. 15. To be able to explain the adaptive immune system. 16. To be able to explain the pathophysiology of immunological diseases. |

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| Course Schedule | <p>Infection Biology:1~10</p> <p>Immunology: 11-15</p> <ol style="list-style-type: none"> 1.Biological characteristics of bacteria 2.Properties of pathogenic and non-pathogenic bacteria 3.Mechanism and regulation of bacterial pathogenicity 4.Control of Infectious disease, antimicrobials, and drug resistance 5.Replication mechanism of parasites & fungi 6.Molecular pathogenesis of parasites & fungi 7.Molecular basis of virus genome replication 8.Molecular pathogenesis of viruses 9.Outline of virus engineering 10.Control mechanism & strategy for viruses 11.Introduction of Immunology 12.The Immune System -Adaptive Immunity 13.The Immune System -Innate Immunity 14.Immunity against Infectious diseases 15.Autoimmune Diseases and Allergy |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by reports and/or examination to evaluate the knowledge listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Read textbooks. |
| Textbook: | <ol style="list-style-type: none"> 1. Microbiology, Principles and Explorations, 6th Edition, Jacquelyn G. Black ed., Wiley, New York, 2012 2. Principles of Virology, 3rd Edition, S. Jane Flint, L. W. Enquist, Vincent R. Racaniello ed., ASM, 2009 3. Cellular and Molecular Immunobiology, 7th Edition, Abbas, Lichtman and Pillai ed., Saunders-Elsevier, Philadelphia, 2012 |
| Room Number | Medical Sciences Building, Room 204 |
| Notes | |
| Keywords | |

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| Course | Human Endocrinology and Metabolism |
| Course No. | 02RA123 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | SprABC Tue3,4 |
| Instructor | Hitoshi Shimano |
| Course Overview | This course aims to develop the students' abilities to understand the theory of the pathophysiology of human endocrine and metabolic disease through learning 1) development, anatomy and function of endocrine tissue, 2) glucose and lipid metabolism, and 3) physiological functions of hormones and pathological conditions caused by their failure. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Endocrine and metabolic disorders present major public health problems in many parts of the world, including obesity, diabetes, cardiovascular disease, adrenal disease, and osteoporosis. This course aims to develop the students' abilities to theoretically understand how hormones work and how their actions are altered in disease states and to improve the quality of patient care in endocrinology and metabolism. |
| GIO (General Instructional Objective) | To understand the general pathophysiological viewpoints and concepts of endocrine and metabolic disease based on molecular and clinical examinations and to learn strategies to obtain the knowledge of particular disease in systemic endocrinology and metabolism. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the biosynthesis, storage, chemistry, and physiological function of hormones and with the cells of the endocrine glands and tissues that secrete them, 2. To be able to explain the metabolism of glucose, fatty acid, cholesterol, and amino acid, 3. To be able to explain the transcriptional regulation of energy metabolism, 4. To be able to explain molecular basis of obesity, appetite, and body weight regulation, 5. To be able to explain the definition and molecular basis of diabetes, 6. To be able to explain the definition and molecular basis of dyslipidemia and atherosclerosis, 7. To be able to explain molecular and clinical basis of major endocrine disease,, 8. To be able to explain molecular basis of bone metabolism. |

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| Course Schedule | <p>1.Introduction of Endocrinology and Metabolism (Shimano H, 4/15)</p> <p>2.Transcriptional Regulation of Energy Metabolism (Nakagawa Y, 4/22)</p> <p>3.Nutrigenomics (Yahagi N, 5/9)</p> <p>4.Fatty Acid Metabolism and Metabolic Disease (Matsuzaka T, 5/13)</p> <p>5.Bone Metabolism (Shimada M, 5/20)</p> <p>6.Diabetes (Yatoh S, 5/27)</p> <p>7.Body Weight Regulation and Obesity (Iwasaki H, 6/3)</p> <p>8.Lipoprotein metabolism (Yagyu H, 6/10)</p> <p>9.Pituitary and Adrenal disease (Suzuki H, 6/17)</p> <p>10.Current Topics in Endocrinology and Metabolism (Yahagi N, 6/24)</p> |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the short tests after each class (50%) and final examination (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | <p>Read textbooks and General Endocrinology and Metabolism Notes.</p> <p>Discuss with teacher and students and improve own ability for research, specialty, and creativity.</p> |
| Textbook: | <p>『Joslin ' s Diabetes Mellitus』 14th Edition, Kahn CR, Weir GC, King GL, Jacobson AM, Moses AC, Smith RJ ed., Lippincott Williams & Wilkins</p> <p>『Williams Textbook of Endocrinology』 10th Edition, Larsen PR, Kronenberg HM, Melmed S, Polonsky KS, Foster DW, and Wilson JD ed., Saunders 2002</p> <p>『Endocrinology』 5th Edition, Degroot L, Jameson JL ed., Saunders 2005</p> |
| Room Number | Health and Medical Science Innovation Laboratory, Meeting Room 105 |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Environmental Medicine |
| Course No. | 02RA124 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprABC Wed4 |
| Instructor | Yoshito Kumagai |
| Course Overview | This course aims to lead the students to acquire 1) better understanding of the condition of environmental substances existing in the air, water, soil and food products, and their biological effects on organisms and 2) skills for discussing the mechanisms of related adverse reactions. |
| Remarks | Identical to 01RC405. Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Environmental Medicine has increasingly become a subject of concern to the general public in recent years. The environment in which humans live is complex, and we may encounter many different potentially toxic chemical substances during the course of our lives. In this course, students will study 1) the general aspect of Environmental Medicine, 2) environmental chemicals (e.g., polycyclic aromatic hydrocarbons and volatile chemicals in the atmosphere, diesel fumes, tobacco smoke components, heavy metals and endocrine disruptors in food, toxic metalloid in groundwater, nano-particles etc.) as modulators of human disease and dysfunction and 3) exposure-response relationships of environmental chemicals in the body. |
| GIO (General Instructional Objective) | To understand the general concepts of environmental medicine involving the interactions between environment and human health, and the role of the environment in causing or mediating disease. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain interaction of environmental chemicals with cellular macromolecules, 2. To be able to explain environmental chemicals in the atmosphere and its health effects, 3. To be able to explain contamination of groundwater and its health effects. 4. To be able to explain food-related health risks, 5. To be able to explain the effects of endocrine disrupting chemicals on humans such as dioxin, 6. To be able to explain fish consumption and risk of mercury poisoning, 7. To be able to explain lead poisoning from leaded gasoline, paint, and plumbing, 8. To be able to explain molecular basis of cellular defense mechanisms against environmental chemicals. |

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| Course Schedule | <p>1.Introduction to Environmental Medicine</p> <p>2.Interaction of Environmental Chemicals with Cellular Macromolecules</p> <p>3.Environmental Chemicals in the Atmosphere and Health Effect</p> <p>4.Metalloids in Groundwater and Health Effect</p> <p>5.Food-Related Health Risks</p> <p>6.Cellular Defense Systems against Environmental Chemicals</p> <p>7.Endocrine Disrupting Chemicals</p> <p>8.Bio-concentration in Fish: Benefit and Risk</p> <p>9.Industrial Chemicals and Health Effect</p> <p>10.Environmental Metals and Health Effects</p> |
| Homework | |
| Grading Methods and Criteria | <p>The students are evaluated by the short tests after each lectures (50%) and an end-of-term examination (50%).</p> <p>In the above examinations, the students who got;</p> |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Read textbooks and Environmental Medicine Notes. |
| Textbook: | <p>1. Environmental Medicine, Ayres, Harrison, Nichols and Maynard ed., Hodder Arnold, LD, 2010</p> <p>2. Introduction to Environmental Toxicology: Molecular Substructures to Ecological Landscapes, Landis, Sofield and Yu ed., CRC Press, NW, 2011</p> <p>3. Lu ' s Basic Toxicology: Fundamentals, Target Organs, and Risk Assessment, 5th edition, Lu and Kacew ed., informa healthcare, NY, 2009</p> |
| Room Number | Health and Medical Innovation Laboratory, Room 301-2 |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Biochemistry and Molecular Biology |
| Course No. | 02RA130 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprAB Mon1 |
| Instructor | Kenji Irie |
| Course Overview | This course is designed for the students to learn about 1) the structure, function and metabolism of human biomolecules to understand life phenomena at the molecular level and 2) the structure and function of human cells to understand their molecular function in life phenomena at the cellular level. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Biochemistry and molecular biology are the most fundamental study to understand human biology at the molecular and cellular levels. They include the chemical structure, function, synthesis and metabolism of human biomolecules in life phenomena. They also include the study to understand the structure of the cell and the functions of cellular organelles. In this course, students should be able to establish the fundamental knowledge to deeply understand human biology. |
| GIO (General Instructional Objective) | To establish the fundamental knowledge for the chemical and molecular basis of human biomolecules, their functions in life phenomena, cell structure and the function of cellular organelles critical for maintaining the homeostasis of human body |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain chemical structures of biomolecules including nucleotides, peptides/proteins, sugars, lipids and signaling molecules. 2. To be able to explain structure of the cell and functions of cellular organelles. 3. To be able to explain genomic structure and gene expression. 4. To be able to explain transcriptional control. 5. To be able to explain cellular metabolism. 6. To be able to explain cell proliferation, cellular shape, and their regulations. 7. To be able to explain molecular basis of intracellular signal transduction. 8. To be able to discuss molecular mechanisms of biological events in human body. |
| Course Schedule | <ol style="list-style-type: none"> 1.DNA, Chromosomes, and Genomes (Aya Fukuda) 4/11 2.DNA Replication, Repair, and Recombination (Kenji Irie) 4/18 3.Transcription, and Control of Gene Expression (Aya Fukuda) 4/25 4.Translational Mechanisms and Regulations (Koji Hisatake) 5/9 5.Metabolism I: glycobiochemistry (Kensuke Shiomi) 5/16 6.Metabolism II: glycobiochemistry (Kensuke Shiomi) 5/23 7.Metabolism III: lipids and amino acids(Aya Fukuda) 5/30 8.Cell Cycle (Mizuno T.) 6/6 9.Intracellular Signal Transduction (Kazuko Masu) 6/13 10.Cell Proliferation and Cancer (Kazuhiko Uchida) 6/20 11.Final Exam 6/27 To be announced if any |
| Homework | |
| Grading Methods and Criteria | <p>Class participation 30%</p> <p>Final Examination 70%</p> |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read reference books. |
| Textbook: | Not Determined. |
| Room Number | Room 204, Medical Sciences Building, Medical Area |
| Notes | Reference books: Essential Cell Biology (written by Bruce Alberts et al., Garland Science) Molecular Biology of the Cell (written by Bruce Alberts et al., Garland Science) |
| Keywords | |

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|---------------------------------------|--|
| Course | Molecular Cell Biology |
| Course No. | 02RA140 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Tue3 |
| Instructor | Tomoki Chiba |
| Course Overview | In this course, the students will learn about the molecular mechanisms underlying the fundamental cellular events and discuss the latest topics in the field. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Cell is the smallest unit of all living creatures. Unraveling of its behaviors at molecular level is central for the understanding of the human biology. In this lecture, the fundamental principles and topics in the field of cell biology and evolution will be discussed so that our understanding of human biology will advance. |
| GIO (General Instructional Objective) | To give the students the ability to explain the principles of the molecular mechanism underlying various aspects of the cells, from cell cycle to evolution. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the principles of evolution and discuss its recent topics, 2. To be able to explain the principles of cell biology at the level of molecular mechanism and discuss its recent topics. |
| Course Schedule | 1.Introduction to Molecular Cell Biology 2.Evolution I 3.Evolution II 4.Transcription 5.Translation 6.Traffic 7.Degradation 8.Cytoskeleton 9.Signal Transduction 10.Cell cycle |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the short tests or reports after each class (50%) and final examination (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read textbooks and original articles that cover recent topics in cell biology and evolution. |
| Textbook: | 1. "Molecular Biology of the Cell" 6th edition, Alberts B., et al (2014). 2. "Molecular Cell Biology" 7th edition, Lodish H., et al, (2012). 3. "Evolution" Barton N., et al, (2007) |

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| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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| Course | Pharmacology |
| Course No. | 02RA150 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallC Mon/Wed/Fri7 |
| Instructor | Masashi Yanagisawa |
| Course Overview | In this course, the students should be able to deepen their understanding of the background, content, and method of studies in pharmacology by reading, summarizing, and reporting on highly-influential original papers in the field. The student should also be able to understand the implementation of pharmacological studies by discussing the pharmacological significance of discoveries made by the studies and their influence on clinical practice. |
| Remarks | Lectures are conducted in English. Not open in 2016. 2015/04/01 開講中止決定 |
| Course Type | lectures |
| Outline | Pharmacology is the study of bioactive molecules which alter normal or abnormal function of living organism. In this course, students understand the molecular-, cellular-, and systems-level mechanism for the action of bioactive molecules by reading landmark original papers with great scientific and historical significance. Students also learn the methodology and logic of pharmacological inquiries through discussion with classmates and by proposing an original research plan. |
| GIO (General Instructional Objective) | To understand the mechanism for the action of bioactive molecules through critical reading of significant original papers, and by proposing an original pharmacological research project. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain bioactive molecules working through G protein-coupled receptors. 2. To be able to explain bioactive molecules affecting brain functions, including sleep/wakefulness, anxiety and mood, appetite, and addiction. 3. To be able to explain bioactive molecules which work on the circulatory system. 4. To be able to present a brief overview of an original paper. 5. To be able to present the scientific significance of original papers. 6. To be able to ask intelligent questions about original papers presented. 7. To be able to propose an original research plan a field of pharmacology. |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the quality of the presentation, discussion in the class, and the original research project. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |

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| Assignment | |
| Textbook: | Goodman and Gilman's The Pharmacological Basis of Therapeutics, 12th Edition (McGraw-Hill Professional) Laurence Brunton, Bruce Chabner, Bjorn Knollman Basic and Clinical Pharmacology, 11th Edition, Bertram Katzung, Susan Masters, Anthony Trevor Foye's Principles of Medicinal Chemistry, 7th Edition (Lippincott Williams & Wilkins) Thomas L. Lemke |
| Room Number | Health and Medical Science Innovation Laboratory, 501 |
| Notes | |
| Keywords | |

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| Course | Basic Toxicology |
| Course No. | 02RA160 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Wed4 |
| Instructor | Yoshito Kumagai |
| Course Overview | In this course, the students will learn 1) dose-response relations that are fundamental in toxicology and understand the onset mechanism of toxicity caused by chemical substances at the molecular level, and 2) the biological defense system against chemical substances and understand basic toxicology. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Toxicology is the study of the nature and mechanisms underlying toxic effects exerted by substances on living organisms and other biological systems. Toxicology also deals with quantitative assessment of the adverse effect in relation to the concentration of dosage, duration, and frequency of exposure of the organisms. Along with other sciences, toxicology contributes to the development of safer chemicals used as drugs, food additives, and agricultural chemicals and industrial chemicals. In this course, the students will study 1) the general aspect of toxicology (in particular, chemical toxicology and molecular toxicology), 2) biotransformation of toxicants involved in the detoxification and metabolic activation resulting in dysfunction of macromolecules and cell damage, 3) initial response and cellular protection against toxicants, and 4) toxicological evaluation. |
| GIO (General Instructional Objective) | To understand the general concepts of toxicology based on molecular and clinical evidence. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain target organs of toxicants and typical symptoms of poisoning. 2. To be able to explain absorption, distribution, and excretion of toxicants. 3. To be able to explain metabolism and metabolic activation of toxicants. 4. To be able to explain toxicological responses to chemical insult. 5. To be able to explain oxidative stress caused by toxicant exposure. 6. To be able to explain detoxification and treatments of poisoning. 7. To be able to explain molecular basis of cellular defense systems against toxicants. 8. To be able to explain mutagenesis and carcinogenesis caused by toxicant exposure. <p>Course Schedule:</p> |

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| Course Schedule | <p>1.Introduction to Toxicology</p> <p>2.Absorption, Distribution and Excretion of Toxicants</p> <p>3.Biotransformation of Toxicants: Detoxification-1</p> <p>4.Biotransformation of Toxicants: Detoxification-2</p> <p>5.Biotransformation of Toxicants: Metabolic Activation-1</p> <p>Biotransformation of Toxicants: Metabolic Activation-2</p> <p>6.Oxidative Stress and Toxicants</p> <p>Cellular Protection Systems against Toxicants</p> <p>7.Mutagenesis and Carcinogenesis</p> <p>8.Target Organs and Toxic Substances</p> <p>9.Toxicological Evaluation</p> |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the short tests after each lectures (50%) and an end-of-term examination (50%). |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Read textbooks and Basic Toxicology Notes. |
| Textbook: | <p>1. Lu ' s Basic Toxicology: Fundamentals, Target Organs, and Risk Assessment, 5th edition, Lu and Kacew ed., informa healthcare, NY, 2009</p> <p>2. Drug Mtabolizing Enzymes: cytochrome P450 and Other Enzymes in Drug Discovery and Development, Lee, Obach and Fisher ed., Marcel Dekker Inc., NY, 2003</p> <p>3. Oxidative Stress in Vertebrates and Invertebrates: Molecular Aspects of Cell Signaling, Farooqni and Farooqui ed., John Wiley & Sons Inc., NJ, 2012.</p> |
| Room Number | Health and Medical Innovation Laboratory, Room 301-2 |
| Notes | |
| Keywords | |

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| Course | Human Chemical Biology |
| Course No. | 02RA170 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Tue2 |
| Instructor | Masaki Kita |
| Course Overview | Human Chemical Biology provides the opportunity for the students to understand human beings biologically, and learn basic knowledge and concepts of chemistry through studying organic chemistry, biochemistry and instrumental analysis. They are all important to learn chemical biology based on knowledge of organic compounds. Moreover, students will study the forefront of applied analysis research to develop useful new materials such as therapeutic medication and diagnostic drugs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Chemical biology is an interdisciplinary research field between chemistry and biology that involves the application of chemical techniques and tools to the study and manipulation of biological systems. Utilizing chemical principles to modulate biological systems should help to investigate the underlying Human Biology and to create new functions. In this course, students study the general aspects of Chemical Biology, Organic Chemistry, Biochemistry, and Spectroscopic Analysis of the small molecules that are critical for living systems. |
| GIO (General Instructional Objective) | <ol style="list-style-type: none"> 1. To understand basic knowledge and concept of chemical biology through the study on organic chemistry, biochemistry, and spectroscopic analysis 2. To learn strategies to create small molecules such as therapeutic agents and diagnostic drugs |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the structures and functions of physiologically active molecules and natural products in terms of organic chemistry 2. To be able to explain continuous chemical reactions of life actions and phenomena on the basis of organic and biological chemistry 3. To be able to explain the basic principles and methods of spectroscopic analysis of organic molecules 4. To be able to give examples and explain principles, methodologies, and significances in chemical biology |
| Course Schedule | <ol style="list-style-type: none"> 1.Introduction of Chemical Biology 2.General Biochemistry 3.Organic Chemistry 1: Structure of Organic Molecules 4.Organic Chemistry 2: Synthesis and Reactions 1 5.Organic Chemistry 3: Synthesis and Reactions 2 6.Organic Chemistry 4: Spectroscopic Analysis 7.Chemical Biology of Physiologically Active Substances 8.Chemical Biology and Bioorganic Chemistry: Tumor Promoting Agents and Antitumor Substances 9.Current Topics in Human Chemical Biology 1 10.Current Topics in Human Chemical Biology 2 (Introduction of representative papers and free discussion) |

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| Homework | |
| Grading Methods and Criteria | Students are evaluated by the short quizzes for attendance after each class (50%) and final report (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read textbooks and the recent general reviews / articles on Chemical Biology. Consider the significance and novelty of the representative articles on Chemical Biology. |
| Textbook: | Reference book: 1. McMurry et al. Fundamentals of General, Organic, and Biological Chemistry, 6th edition, Prentice Hall, 2009 2. Sorrell, Organic Chemistry, 2nd edition, Univ Science Books, 2005 3. Hesse, Spectroscopic Methods in Organic Chemistry, Thieme Medical Pub, 2007 4. Schreiber, Chemical Biology: From Small Molecules to Systems Biology and Drug Design, Weinheim, Wiley-VCH, 2007 |
| Room Number | Room 706, Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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| Course | Frontier Science in Drug Discovery |
| Course No. | 02RA180 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Wed5 |
| Instructor | Satoru Takahashi, Hisashi Oishi |
| Course Overview | In this course, the students will be able to grasp the basic concepts of the logical process of drug discovery by using computational simulation technology. They will learn chemosynthesis, by using in silico screening of lead compounds, molecular design, and combinatorial chemistry methods, and current pharmacokinetics studies to deepen their knowledge of linkages between medical and pharmaceutical sciences. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Scientific advancements during the past two decades have created a paradigm shift in drug discovery process from the traditional approach including long experiences and contingencies to innovative methods, which are based on logical approach utilizing the latest in computational simulation technology. The recent progress includes genome-wide identification of successful drug-target proteins and in silico designing and screening of lead compounds with the techniques of combinatorial chemistry. In addition, there has been remarkable progress in the field of ADME assessment and drug delivery system. This program will be focused on the fundamentals of the process of the drug discovery and development and strengthening of medical-pharmaceutical relations. |
| GIO (General Instructional Objective) | Upon completion of this course, students will be able to examine current drug discovery and development issues through various disciplines |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the principles of generation of new drugs. 2. To be able to explain the principles of in silico design of new drugs. 3. To be able to explain the principles of drug delivery system. |
| Course Schedule | To be announced |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the attendance and discussion in each class (50%) In addition to the above requirements, students are asked to write a report related the course (50%) |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Skimming the pre-distributed files. |
| Textbook: | |
| Room Number | Medical Sciences Building, Room 204 |
| Notes | The lecture is organized by faculty member of Tokyo University of Science and is joist lecture of Master's program in Medical Sciences. |

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| Course | Structural Biology of Macromolecules |
| Course No. | 02RA181 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprA Tue1,2 |
| Instructor | Toshiya Senda |
| Course Overview | When macromolecules (Proteins, DNA, RNA) perform their functions inside a cell, they require specific structures in order to demonstrate their biological roles. Structural biology is a research field that investigates macromolecular structures in order to understand their mechanisms at the atomic/molecular level. This course is designed to assist students in the understanding of structural biology methods, and their applications in life and medical sciences. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | When macromolecules (Proteins, DNA, RNA) perform their functions inside a cell, they require specific structures in order to demonstrate their biological roles. Structural biology is a research field that investigates macromolecular structures in order to understand their mechanisms at the atomic/molecular level. This course is designed to assist students in the understanding of structural biology methods, and their applications in life and medical sciences. |
| GIO (General Instructional Objective) | To understand how structural biology contributes to life sciences. To understand the relationship between structural biology and biology. To understand the contribution of structural biology to drug discovery. To understand the basic methodology of structural biology. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the basic characteristics and structures of amino acids and proteins. 2. To be able to access PDB (Protein Data Bank), and investigate protein structures using a graphic program on your own PC. 3. To be able to explain what materials and equipment you need to perform structural analysis. 4. To be able to explain the advantages/disadvantages of each method in structural biology |
| Course Schedule | 1.Apr 12 Senda T. Introduction of structural biology 2.Apr 12 Senda T. How to use PDB (Protein Data Bank) 3.Apr 19 Yumoto F. X-ray crystallography and NMR 4.Apr 19 Yumoto F. Strengths and weaknesses of each method, A hybrid approach 5.Apr 26 Gerle C. Electron microscope and structural biology 6.Apr 26 Gerle C. State-of-the-art electron microscope 7.May 10 Tanabe M. Biochemistry and structural biology |

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| | <p>8.May 10 Tanabe M. Protein expression and purification, Protein-Protein Interaction</p> <p>9.May 17 Senda T. Introduction to experiments in structural biology I (Visit experimental facilities for X-ray crystallography at KEK (High Energy Accelerator Research Organization) in Tsukuba)</p> <p>10.May 17 Senda T. Introduction to experiments in structural biology II (Visit experimental facilities for X-ray crystallography at KEK (High Energy Accelerator Research Organization) in Tsukuba)</p> |
| Homework | To be announced if any |
| Grading Methods and Criteria | Class participation 50% Final report 50% |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Mini test the basic knowledge related to the lecture ' s topic |
| Textbook: | Not Determined. |
| Room Number | Room 706, Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Neurobiology |
| Course No. | 02RA182 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Mon7 |
| Instructor | Kasper Vogt |
| Course Overview | The aim of the series was to provide students an introduction to basic neurophysiology, a topic students are not generally exposed to in their undergraduate curriculum. All lectures and discussions will be performed in English. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Human and animal behavior is the result of neural activity across highly specialized and interconnected networks of neurons. In this series the students will be introduced to the basic biophysical principles that govern the activity patterns of neurons. How sensory stimuli translate into neuronal discharge patterns, how this activity is propagated and transmitted to other neurons. |
| GIO (General Instructional Objective) | The aim of the series was to provide students an introduction to basic neurophysiology, a topic students are not generally exposed to in their undergraduate curriculum. All lectures and discussions will be performed in English. |
| SBO (Specific Behavioral Objectives) | Upon completion of this course, students will understand the basics of neurophysiology. Moreover, logical discussion skills in English will be improved. |
| Course Schedule | <p>The instructor will give lectures following the topics listed below. Students are expected to discuss actively with in the instructor and classmates and raise at least one meaningful question or comment during each session.</p> <p>1.Introduction: The introduction covers the overall aims of the series, what the students are expected to understand after the twelve lectures. I introduce them to the principles of bioelectrical phenomena and how they were discovered. The fundamental properties of ion diffusion are discussed.</p> <p>2.Electrochemical Gradients: Ion gradients and their electrochemical properties are discussed. I explain the equilibrium condition and introduce the Nernst equation. The distribution of sodium and potassium ions across the cell membrane and their equilibrium potentials are introduced.</p> <p>3.Passive Membrane Properties: The membrane as a combination of ohmic resistor and capacitance are presented. I show the students how these passive membrane properties limit the passive response of the membrane both in space and time.</p> <p>4.Action Potential: I introduce the action potential as an active electrical signal that can overcome the passive limitations of neuronal membranes. The rapid opening and closing of ion conductances is discussed.</p> <p>5.Voltage-Gated Ion Channels: I discuss ion channel families with the students, covering evolutionary aspects and the role of the large number of subtypes in certain channel families. The biophysical basis for ion selectivity and gating are introduced.</p> |

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| | <p>6.Ligand-Gated Ion Channels: The main classes of ligand gated ion channels are taught. The discovery of chemical transmission by Otto Loewi is presented.</p> <p>7.Synaptic Transmission: Building of lecture 6, the concept of synaptic transmission is explained - focusing on presynaptic mechanisms. The students learn about vesicle cycles, the release machinery, docking and priming and the readily releasable pool. Short-term synaptic plasticity (paired-pulse ratio) is worked out from the basic principles of pool exhaustion and residual calcium. I split this lecture in to two segments, because of the large amount of material covered</p> <p>8.Electrophysiology Techniques: In this lecture I present two of the main ex-vivo electrophysiology techniques: field recordings and whole-cell patch clamp recordings. The basics of performing and experiment and of interpreting its result are introduced.</p> <p>9.Basic Circuits (Spinal Cord): The patellar stretch reflex is demonstrated with a volunteer. The basic anatomy and function of the underlying circuitry are then worked out with the students - using the knowledge they have gained so far.</p> <p>10.Sensory Systems Overview: Sensory transduction in the eye, ear, nose and skin is shown from a functional perspective. How do the transducers work? The principle of feature extraction is then presented and the students are shown that sensation is an active and selective process. Prominent sensory illusions are shown to illustrate this.</p> <p>11.Synaptic Plasticity: Long-term synaptic plasticity as a potential learning mechanism is introduced, starting with Hebb's postulate of learning at the network level. The basic physiology of long-term potentiation (LTP) and long-term depression (LTD) is presented, with an emphasis on the role of coincident pre- and postsynaptic activity, NMDA receptors and the influx of calcium ions into the postsynaptic structures.</p> <p>12.Recapitulation: I will prepare a few challenges for the students in lecture 11. Their solution will depend on knowledge from all previous 11 lectures. We will solve them together and clear remaining questions.</p> |
| Homework | |
| Grading Methods and Criteria | <p>Evaluation for the students in functional neurobiology: 30% for participation (active involvement in asking or answering questions) 70% for a final report</p> |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60)</p> |

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| Assignment | |
| Textbook: | “ Neuroscience 5th edition ” by Dale Purves et al. |
| Room Number | Meeting room of IIS Building (if possible) |
| Notes | Office hours available any time upon request via e-mail |
| Keywords | |

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| Course | Mathematics for Biology |
| Course No. | 02RA190 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Mon5 |
| Instructor | Kazuhiro Kawamura |
| Course Overview | Mathematics for Biology engages the students in a review of elementary calculus and linear algebra. The students will further learn the mathematics focusing on biological study, such as analysis of systems settled by differential and difference equations in particular. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | We discuss basics of mathematical methods in biology via simple models of biological systems. We focus on the deterministic model described by differential equations. |
| GIO (General Instructional Objective) | Understanding basic mathematics applied in biology; construction of mathematical models, their mathematical analysis and biological interpretations. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To have good understanding of basic mathematics including calculus and linear algebra, 2. To be able to analyze the models by making use of basic mathematics, 3. To be able to make the appropriate interpretations on the analysis from biological viewpoint, 4. To be able to discuss these procedures from both the mathematical and the biological viewpoints. |
| Course Schedule | <ol style="list-style-type: none"> 1. Elementary calculus and linear algebra 2. Logistic equations 3. Mathematical models of biological systems 4. Differential equations |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the activities in the class, report submissions, and the final examination. The details will be announced at the beginning of the class. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | |
| Textbook: | <ol style="list-style-type: none"> 1. L.J.S. Allen, An introduction to mathematical biology, Pearson, Prentice Hall 2007 2. M. Braun, Differential equations and their applications, 4th ed., Springer, 1993. |

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| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Application of Information Technology in Science |
| Course No. | 02RA200 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallAB Intensive |
| Instructor | Takeshi Nagata |
| Course Overview | In this course, students will learn 1) application of information technology to biology from over-viewing computational science including numerical analysis, statistical analysis, and image analysis and 2) practical programming by using Excel, and Matlab (Octave). |
| Remarks | Lectures are conducted in English. Not open in 2016. |
| Course Type | lectures |
| Outline | Today, in science, practical use of IT is indispensable. In this course, students learn about practical use of IT in science through overlooking the computational science in a broad sense (from numerical analysis to statistics analysis and image analysis), and practical programming with Excel, Matlab (Octave). |
| GIO (General Instructional Objective) | To get the viewpoint of IT practical use, and apply it to their own research. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain about the benefits of the use of IT in science, 2. To be able to explain the feature of various programming tools, 3. To be able to choose the suitable tool for their own research, 4. To be able to perform simple programming, and computation. |
| Course Schedule | 1.Introduction to IT in science 2.Practical use of the spreadsheet tool Excel [1] Description and visualization of an simple mathematical formula (linear equations, statistics analysis) 3.Practical use of the spreadsheet tool Excel [2] VBA programming (least-squares method) 4.Numerical computing environment Matlab(Octave) [1] Introduction (multivariate statistics) 5.Numerical computing environment Matlab(Octave) [2] Various examples of numerical-analysis (frequency analysis, machine learning). 6.Numerical computing environment Matlab(Octave) [3] Powerful visualization (3D visualization, a cell division simulation, animation). 7.7.Numerical computing environment Matlab(Octave) [4] Image Processing (using Image Processing toolbox). |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the short tests after each class (50%) and report (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |

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| Assignment | Basic knowledge to operate the PC. |
| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Application of Information Technology in Science |
| Course No. | 02RA205 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | FallAB Intensive |
| Instructor | Takeshi Nagata |
| Course Overview | In this course, students will learn 1) application of information technology to biology from over-viewing computational science including numerical analysis, statistical analysis, and image analysis and 2) practical programming by using Excel, and Matlab (Octave). |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Today, in science, practical use of IT is indispensable. In this course, students learn about practical use of IT in science through overlooking the computational science in a broad sense (from numerical analysis to statistics analysis and image analysis), and practical programming with Excel, Matlab (Octave). |
| GIO (General Instructional Objective) | To get the viewpoint of IT practical use, and apply it to their own research. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain about the benefits of the use of IT in science, 2. To be able to explain the feature of various programming tools, 3. To be able to choose the suitable tool for their own research, 4. To be able to perform simple programming, and computation. |
| Course Schedule | 1.Introduction to IT in science 2.Practical use of the spreadsheet tool Excel [1] Description and visualization of an simple mathematical formula (linear equations, statistics analysis) 3.Practical use of the spreadsheet tool Excel [2] VBA programming (least-squares method) 4.Numerical computing environment Matlab(Octave) [1] Introduction (multivariate statistics) 5.Numerical computing environment Matlab(Octave) [2] Various examples of numerical-analysis (frequency analysis, machine learning). 6.Numerical computing environment Matlab(Octave) [3] Powerful visualization (3D visualization, a cell division simulation, animation). 7.7.Numerical computing environment Matlab(Octave) [4] Image Processing (using Image Processing toolbox). |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the short tests after each class (50%) and report (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |

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| Assignment | Basic knowledge to operate the PC. |
| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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|---------------------------------------|--|
| Course | Reproductive Biology |
| Course No. | 02RA230 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | FallAB Tue5,6 |
| Instructor | Tadashi Baba |
| Course Overview | The essential significance of “ reproduction ” will be considered under the current social conditions in the world. Reproductive technology for the future will be also be discussed as an ethical issue. Students need to have a fundamental grounding in reproductive biology before taking this class. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | Based on the current social conditions in the world, the essential significance of “ reproduction ” will be concerned. Reproductive technology for the future will be also discussed ethically. |
| GIO (General Instructional Objective) | To learn the continuity of life in human and other species. |
| SBO (Specific Behavioral Objectives) | 1. To be able to consider the importance/significance of your life, 2. To be able to take pleasure in being alive, 3. To be able to understand the importance/significance of living creatures and human beings on the earth. |
| Course Schedule | 1.Introduction to Reproductive Biology 2.Importance/significance of Oocytes I 3.Importance/significance of Oocytes II 4.Importance/significance of Sperm I 5.Importance/significance of Sperm II 6.Importance/significance of Fertilization 7.Importance/significance of Embryos 8.Importance/significance of Reproductive Technology I 9.Importance/significance of Reproductive Technology II 10.Importance/significance of Reproductive Technology III |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by short tests after each class (100%). |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read general textbooks. |
| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
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|---------------------------------------|--|
| Course | Gene Engineering and Genetically Modified Mice |
| Course No. | 02RA231 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC Tue5 |
| Instructor | Satoru Takahashi |
| Course Overview | Gene Engineering and Genetically Modified Mice provides the opportunity for the students to study fundamental techniques of gene engineering and principle of making transgenic mice which is application of gene engineering. In addition, the students will debate how to use this lecture for their researches. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | There is great advance in gene engineering in the last decade, for example, introducing exogenous genes in to the genome and genome editing by using artificial enzymes. In this subject, these new technologies are introduced to the students. In addition, students study detail about generation method of genetically modified mice based on these technologies and its application for biomedical researches. |
| GIO (General Instructional Objective) | To understand the general technical viewpoints and concepts of gene engineering methods and to learn strategies for generation methods of genetically modified mice. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain history of gene engineering 2. To be able to explain virus mediated gene transfer 3. To be able to explain working mechanism of artificial nucleases, for example Zinc finger nuclease, TALEN and CRISPR 4. To be able to explain generation method for transgenic mice 5. To be able to explain generation method for knock-out mice 6. To be able to explain generation method for conditional knock-out mice |
| Course Schedule | <ol style="list-style-type: none"> 1.Introduction to gene engineering, History 2.Gene transfer method to the cells 3.Gene transfer method by using virus vectors 4.Artificial nuclease, Zinc finger nuclease, TALEN 5.Generation method for transgenic mice 6.Generation method for knock-out mice 7.Generation method for conditional knock-out mice 8.Generation method for induced pluripotent stem cells 9.Application of genetically modified mice 10.Planning of genetically modified mice |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by class attendance and participation (50%) and report to evaluate the knowledge listed in the SBO, the report title is provided at the end of the course (50%). |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | Read handouts of the classes and related papers. |
| Textbook: | To be announced if any. |
| Room Number | Medical area 4B119 |
| Notes | |
| Keywords | |

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|---------------------------------------|--|
| Course | Epigenome Physiology |
| Course No. | 02RA232 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprC Mon5,6 |
| Instructor | Akiyoshi Fukamizu, Keiko Hirota |
| Course Overview | In this course, the students should be able to grasp the outline of the biological consequences of two genetic codes, genome and epigenome. The students give a presentation on the theme related to these codes and get a better understanding of them by asking and answering questions. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | Genome remains largely unchanged in most cells of an organism through its entire life. On the other hand, epigenome is dynamic during development and differentiation to determine and maintain cell-specific gene expression profiles that define cellular identity and function. The epigenome is composed of all genome-wide chromatin modifications, such as DNA methylation and histone modifications, which are labile during development and altered in disease. This course provides an introduction in physiology regulated by epigenetic function. |
| GIO (General Instructional Objective) | To understand the differential roles between genome and epigenome for biological significance and to learn their physiological functions. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to read papers regarding the epigenomic regulation, 2. To be able to have the presentation (by power point) and explain the physiological and/or pathological roles for epigenome function in diseases, 3. To be able to discuss with and evaluate the point of views presented by the students who take the course. |
| Course Schedule | <ol style="list-style-type: none"> 1.Introduction to genomic and epigenomic functions 2.Example Presentations 3.Presentations by students (1) 4.Presentations by students (2) 5.Presentations by students (3) 6.Summary 7.Presentations by students (4) 8.Presentations by students (5) 9.Presentations by students (6) 10.Overview |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the presentation (50%) and discussion (25%), and the results of peer reviews (25%) listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | Choose and read original papers regarding epigenome. Prepare and make the presentation, by power point, about the papers you read. Discuss and evaluate the presentations. |
| Textbook: | |
| Room Number | 706 Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | DNA, and, histone, modifications, phosphorylation, acetylation, methylation, ubiquitination, trans- generation, gene, transcription |

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|---------------------------------------|---|
| Course | Signal Transduction and Drug Design |
| Course No. | 02RA233 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprAB Thu2 |
| Instructor | Yasunori Kanaho |
| Course Overview | This course is designed to assist the students to learn about intracellular reactions controlling cellular function, i.e. signal transduction and diseases caused by failure in signal transduction. They should then be able to acquire the basic knowledge of drug discovery research through learning about developed drugs and strategies for development of new drugs. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Signal transduction is the inter- and intra-cellular chemical reactions transducing biological information, which are mediated by various types of membrane receptors and intracellular bio-active molecules. Disturbance of signal transduction generally causes diseases. Therefore, knowledge about the signal transduction mechanisms is essential to understand human biology. This course is designed to assist students to understand the relation between molecular mechanisms of signal transduction and diseases. In addition, students will obtain basic knowledge about and recent development of drug design strategy. |
| GIO (General Instructional Objective) | To understand the relation between signal transduction and human diseases. To understand the concepts to treat diseases by targeting signaling molecules. To understand how new drugs are developed and how effective drugs are designed. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain major signal transduction systems. 2. To be able to explain biomolecules involved in signal transduction. 3. To be able to explain the concept to develop new drugs. 4. To be able to explain the drug design to develop efficient drugs. 4. To be able to explain the relation between signal transduction and cancer. 5. To be able to explain the relation between signal transduction and diabetes. 6. To be able to explain the relation between signal transduction and allergy. |
| Course Schedule | 1.Introduction of Signal Transduction and Drug Design (Apr 14) Kanaho Y. 2.Development of anti-virus drugs (Apr 21) Kawaguchi A. 3.Allergy and Signal Transduction (Apr 28) Tahara S. 4.Anti-cancer Immunotherapy (May 12) Shibuya A 5.Cancer and Signal Transduction (May 19) Funakoshi Y. 6.Anti-Cancer Drugs (May 26) Funakoshi Y. 7.Drug Design to Develop Efficient Drugs (Jun 2) Sato T. 8.Translational research for drugs affecting signal transduction (Jun 9) Hashimoto K. 9.Diabetes and Signal Transduction (Jun 16) Shimano H. 10.Anti-diabetes drugs (July 23) Matsuzaka T. |
| Homework | To be announced if any |
| Grading Methods and Criteria | Class participation 30% Report 70% |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Read manuscripts related to signal transduction and related diseases. |
| Textbook: | Not Determined. |
| Room Number | |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Stem Cell Therapy |
| Course No. | 02RA234 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprAB Thu3 |
| Instructor | Osamu Ohneda, Toshiharu Yamashita, Mami Takasaki |
| Course Overview | Stem Cell Therapy engages the students in basic knowledge and application of human stem cells. The students will learn current existing stem cell therapy and also have discussions on future directions of stem cell therapy. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | In this class, students read the latest original articles on regenerative medicine and stem cell biology and perform presentation. Students are expected to understand research purpose, methods, results, and to have a discussion about significance or problem of the article. |
| GIO (General Instructional Objective) | The objective of this class is to learn basic knowledge and the latest research progress on regenerative medicine and stem cell biology fields by reading original articles. In addition, this class aims to improve individual ability to extract the point at issue of the article and discuss with other participants. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to find and select the appropriate original article from major scientific journals by using online searching system, 2. To be able to read and understand the contents of the article, prepare document for the presentation, review the findings of the article within a limited time period 3. To be able to understand the explanation of the presenter, ask question, and have discussion about significance of the articles or problems to be solved, 4. To be able to value the importance and scientific position of the selected articles in the related research field. |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by the achievement of the objectives listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | Continuous search and reading of related article to follow the latest findings on regenerative medicine and stem cell biology. |
| Textbook: | <p>Research articles.</p> <p>Reference book:</p> <ol style="list-style-type: none"> 1. Handbook of Stem Cells Vol1 and 2, Edited by Robert Lanza, ELSEVIER Academic Press. |
| Room Number | Medical Sciences Building, Room 204 |
| Notes | |
| Keywords | |

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| Course | Analysis of Machineries in Human Biology |
| Course No. | 02RA235 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC Wed3 |
| Instructor | Takaaki Sato |
| Course Overview | The students studying in this course should be able to acquire basic knowledge of biomarker research essential for diagnosis and treatment of diseases such as cancer and cardiac disease and its application by mainly using the cutting-edge mass spectrometry system along with metabolomic and proteomic analysis. The students should also be able to foster better understanding of analytical methods applied to drug discovery in life sciences and the environmental field. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Analysis of machineries in human biology is the study of advanced translational research from basic to clinic. In this course, the students understand the cutting-edge technologies and solutions in the field of advanced molecular medicine. The students also learn world-leading technologies by reading the original papers with scientific significance and by utilizing most advanced analytical instruments. |
| GIO (General Instructional Objective) | To understand the most advanced molecular analysis by the next generation of world-leading precision instruments and to learn their clinical applications to detect and isolate molecular biomarkers in human disease. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the necessity of research and development of molecular diagnostic systems, including mass spectrometry, optical imaging, PET, CT, SPECT, and MRI, 2. To be able to explain the cutting-edge technologies and solutions of the advanced molecular analytical instruments, 3. To be able to present a brief overview of an original paper, 4. To be able to present a scientific significance of an original paper, 5. To be able to propose an original research project in the field of molecular diagnostics using the advanced molecular analytical instruments, 6. To be able to utilize the advanced molecular analytical instruments for each basic scientific project. |
| Course Schedule | <ol style="list-style-type: none"> 1.Introduction to Advanced Molecular Diagnostic System 2.Introduction of Mass Spectrometry (MS) 3.Application of Mass Spectrometry (proteome) 4.Application of Mass Spectrometry (metabolome) 5.Application of Mass Spectrometry (genome) 6.Application of Mass Spectrometry (MS imaging) 7.Optical imaging and PET/CT/SPECT/MRI 8.Development of molecular probe 9.Molecular imaging of cancer 10.Translating optical imaging into the clinic |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by scientific quality of their presentations, discussions in the class, and their qualifications are determined by accomplishment of the original research projects. |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Environmental Health Science, Toxicology and Exposure Assessment |
| Course No. | 02RA236 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprB Intensive |
| Instructor | 昌彦 串田 |
| Course Overview | This course focuses on 1) behavior of various chemicals emitted into the global environment as a result of industrial activities, 2) toxicity tests for examining the hazards caused by those chemicals influencing human beings and all the other living organisms, 3) risk assessment on human beings and other living organisms based on hazards and their exposure level, 4) examination of extrapolation of the toxicity test results on laboratory animals to human cases taking account of physiological differences in species between them, and 5) development of new methods of risk assessment to improve its efficiency and accuracy. |
| Remarks | Lectures are conducted in English. 5/20,5/27,6/3,6/10,6/17 |
| Course Type | lectures |
| Outline | As a result of industrial activities, human and non-human organisms are exposed to various types of chemicals (e.g., pesticide residues on food, contaminants in drinking water). Risk assessment is the quantitative estimate of potential effects of these chemicals on human health and environmental significance based on its hazard and exposure level. In this course, students study the general aspects of (1) assessment of hazard and exposure, (2) mechanistic interpretation of hazard identified in experimental animals and its human relevance, and (3) cutting edge techniques in this field. |
| GIO (General Instructional Objective) | To understand the general viewpoints and concepts of risk assessment based on science and regulation and to learn strategies for decision-making processes in risk assessment. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain how to identify hazard of chemicals to human and non-human organisms, 2. To be able to explain how to assess fate, exposure, hazard and risk of chemicals for the environment, 3. To be able to explain the mechanistic interpretation of chemical hazard identified in experimental animals and its human relevance, 4. To be able to explain cutting edge techniques in hazard identification and exposure assessment, 5. To be able to do risk assessment. |
| Course Schedule | 1.Introduction to risk assessment (May 20, Kushida M.) 2.Test methods of Hazard Identification in mammalian toxicity (May 20, Kushida M.) 3.Hazard characterization (May 27, Kushida M.) 4.Hazard characterization (May 27, Kushida M.) 5.ADME (Absorption, Distribution, Metabolism and Excretion) (June 3, Nagahori H.) 6.Alternative methods using cutting edge techniques (ex. iPS & ES cells etc.) (June 3, Saito K.) |

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| | <p>7.Fate, Exposure, Hazard, and Risk assessment for the environment (June 10, Fujisawa T.)</p> <p>8.Fate, Exposure, Hazard, and Risk assessment for the environment (June 10, Fujisawa T.)</p> <p>9.Setting scenarios, Exposure assessment for workers and consumers, Risk characterization (June 17, Matoba Y.)</p> <p>10.Brushup & practice (June 17, Kushida M.)</p> |
| Homework | |
| Grading Methods and Criteria | Students are evaluated by Class attendance and participation (50%) and final examination (50%) to evaluate the knowledge listed in the SBO. |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |
| Assignment | <p>Read references, information on the Web, and literatures.</p> <p>Practice of evaluation of hazard and assessment using related data provided by faculty.</p> <ol style="list-style-type: none"> 1. Casarett & Doull ' s Toxicology: The Basic Science of Poisons, 8th edition, Klaassen CD ed., McGraw-Hill, New York, 2013 2. S.E. Manahan: Environmental Chemistry, Lewis Publisher, 7th edition 3. Global Product Strategy;ICCA Guidance on Chemical Risk Assessment, http://www.icca-chem.org/ICCADocs/ICCA_GPS%20July2011_LowResWEB.pdf |
| Textbook: | |
| Room Number | Room706, Laboratory of Advanced Research A Building |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Basic Experiments in Human Biology |
| Course No. | 02RA240 |
| Credits | 4.0Credits |
| Grade | 1Year |
| Timetable | SprC by request |
| Instructor | Akira Shibuya |
| Course Overview | Through working in the laboratories run by the faculty members, the students should be able to understand the outline of the members' researches and the principles of the fundamental experimental techniques involved. They will also practice the techniques learnt. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | In this subject, at four research laboratories headed by program professors, students learn the outline of each research and basic experimental methods/research concepts and perform elementary experiments/simulation. |
| GIO (General Instructional Objective) | At four research laboratories headed by program professors for one week each, students learn the outline of each research based on the professor's lecture and understand basic experimental methods/research concepts and their principles. In addition, students deepen the above understanding by performing elementary experiments/simulation |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To understand the background and outline of each research content 2. To understand basic experimental methods/simulation by discussion with researchers and collection of papers/books related to the research 3. To perform an elementary experiment/simulation to deepen the understanding |
| Course Schedule | Students attend 4 courses (Grade C), and understand the background and outline of each research content by reading papers related to three topics and discussing with researchers (Grade B). Students carry out elementary experiments and make reports adequately (Grade A). |
| Homework | |
| Grading Methods and Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Grading Criteria | |
| Assignment | |
| Textbook: | Follow instructions given by each professor |
| Room Number | Laboratory of each professor |
| Notes | Students enrolled in April |
| Keywords | |

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|---------------------------------------|--|
| Course | Basic Experiments in Human Biology |
| Course No. | 02RA241 |
| Credits | 4.0Credits |
| Grade | 1Year |
| Timetable | FallAB by request |
| Instructor | Akira Shibuya |
| Course Overview | Through working in the laboratories run by the faculty members, the students should be able to understand the outline of the members' researches and the principles of the fundamental experimental techniques involved. They will also practice the techniques learnt. |
| Remarks | Lectures are conducted in English. Not open in 2016. |
| Course Type | lab works, practical |
| Outline | In this subject, at four research laboratories headed by program professors, students learn the outline of each research and basic experimental methods/research concepts and perform elementary experiments/simulation. |
| GIO (General Instructional Objective) | At four research laboratories headed by program professors for one week each, students learn the outline of each research based on the professor's lecture and understand basic experimental methods/research concepts and their principles. In addition, students deepen the above understanding by performing elementary experiments/simulation. |
| SBO (Specific Behavioral Objectives) | 1. To understand the background and outline of each research content 2. To understand basic experimental methods/simulation by discussion with researchers and collection of papers/books related to the research 3. To perform an elementary experiment/simulation to deepen the understanding |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | Students attend 4 courses (Grade C), and understand the background and outline of each research content by reading papers related to three topics and discussing with researchers (Grade B). Students carry out elementary experiments and make reports adequately (Grade A). |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | Follow instructions given by each professor |
| Room Number | Laboratory of each professor |
| Notes | Students enrolled in September |
| Keywords | |

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|---------------------------------------|---|
| Course | Special Lectures in Human Biology I |
| Course No. | 02RA250 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallABC by request |
| Instructor | Akira Shibuya |
| Course Overview | Special Lectures in Human Biology I provides opportunities for the students to attend the research progress meetings of many laboratories which offer candidate areas of study that the students will aspire to focus on. Featuring the latest research presentations, the students will have discussions on the research achievements, learn professional knowledge, and develop their skills to proceed with research activities. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Special Lectures in Human Biology I provides the opportunities for the students to attend the research progress meetings of several laboratories, which offers candidate area of study that the students will aspire to focus on. Featuring the latest research presentation, the students will have discussions on its research achievements, learn professional knowledge, and develop their skills to proceed with research activities. |
| GIO (General Instructional Objective) | To understand the aims, objectives, materials and methods of the researches, and latest research achievements in selected laboratories. To discuss the presented research achievements with presenters and attendants in the meetings. To figure out the students' focused areas of research. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the objectives and recent achievements of the researches in the selected laboratories, 2. To be able to explain the materials and methods of the researches in the selected laboratories, 3. To discuss on the presented research achievements, 4. To make short reports on the attended research progress meetings, 5. To figure out the research of students' focused areas. |
| Course Schedule | <ol style="list-style-type: none"> 1.Send an e-mail to the responsible faculty members, and decide the schedule of research progress meetings to attend, 2.Attend at least three meetings per each laboratory (i.e., a total of more than 10 meetings are required to attend.), 3.Make a list and a note of attended meetings, |
| Homework | Discuss with the presenters and attendants of the research progress meetings. Figure out what researches are conducted in the attended laboratories. |
| Grading Methods and Criteria | <p>The students are evaluated by their meeting notes and a list of attended meetings. In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further contribute others' study by useful discussion in the meetings, and make an excellent note of the meetings are evaluated as Superior (S; top 10%), - Have active discussion at the attended meetings and make an good note are evaluated as Excellent (A; next upper 20%), - Create a good note of attended meetings are evaluated as Good (B), - Submit a list of attended meetings and the meeting note are evaluated as Average or upper grades (C or upper grades). |
| Grading Criteria | A+: Superior (more than 90: top 10%) |

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| Assignment | |
| Textbook: | |
| Room Number | To be announced |
| Notes | |
| Keywords | |

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| Course | Special Seminars in Human Biology I |
| Course No. | 02RA260 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallABC by request |
| Instructor | Akira Shibuya |
| Course Overview | Special Seminars in Human Biology I provides the opportunity for the students to attend the journal clubs of many laboratories which offers candidate areas of study that the students will aspire to focus on. Featuring the latest original research papers, the students should be able to understand the research objectives, methods, and results, and also have discussions on the meanings, problems, and issues facing the research. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | Special Seminars in Human Biology I provides the opportunities for the students to attend the journal clubs of several laboratories, which offers candidate area of study that the students will aspire to focus on. Featuring the latest original research papers, the students should be able to understand its research objectives, methods, and results, and also to have discussions on its meanings, problems, and issues facing the research. |
| GIO (General Instructional Objective) | To understand the world standard of published papers in the candidate area of study. To have discussions on its meanings, problems, and issues facing the research. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the research objectives, methods, and results of the selected research papers in the journal clubs, 2. To be able to explain the meanings and problems of the research papers, 3. To discuss on issues remained in the research field after reading selected research papers, 4. To make short reports on each selected research paper, 5. To figure out world standard of the research papers in the candidate area of study. |
| Course Schedule | <ol style="list-style-type: none"> 1.Send an e-mail to the responsible faculty members, and decide the schedule of attending journal clubs 2.Attend at least three journal clubs per each laboratory (i.e., a total of more than 10 journal clubs are required to attend.), 3.Make a list of the attended journal clubs with professors evaluation and the study record (a file). |
| Homework | Discuss with the presenters and attendants of the attended journal clubs. Figure out what researches are being conducted in the world. |
| Grading Methods and Criteria | <p>The students are evaluated by the list of attended journal clubs with the professors' evaluations and the study record (a file, research papers, notes of discussion etc.)</p> <p>In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further help others' study by useful discussion in the journal clubs and make the excellent study record are evaluated as A+: top 10%. - Make active discussions on the research papers at the journal clubs and make good study record are evaluated as A; upper 25%. - Make a good study record of research papers are evaluated as B. |

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| Assignment | |
| Textbook: | |
| Room Number | To be announced |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Special Research in Human Biology I |
| Course No. | 02RA270 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallABC by request |
| Instructor | Akira Shibuya |
| Course Overview | In the Special Research in Human Biology I course, the students gain practical understanding of the principles and methods of research skills in many laboratories which offer candidate areas of study that the students will aspire to focus on. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | In the Special research in human biology I course, the students will practically understand the principles and methods of research skills in several laboratories, which offer candidate area of study that the students will aspire to focus on. |
| GIO (General Instructional Objective) | To understand the practical skills for research experiments, evaluation of each experimental result, decision of the next experiment, and practical management of the laboratory. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to practice specific experiments, 2. To make well-organized daily experimental notes and systemic protocols, 3. To be able to evaluate the experimental results, 4. To be able to make a decision to proceed the projects or modify the conditions of current experiments, 5. To strictly observe the rules on common samples, discards, equipment usages and so on. |
| Course Schedule | <ol style="list-style-type: none"> 1.Send an e-mail to the responsible faculty members and decide the schedule of attending research practices 2.Attend experiments at each laboratory for at least one week (note: a total of more than three laboratories are required to attend.), 3.Practice experiments together with faculty members or PhD students, 4.Make daily experimental notes and systemic protocols. |
| Homework | |
| Grading Methods and Criteria | <p>The students are evaluated by the practical skills and the files of experimental notes and systemic protocols.</p> <p>In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further keep attention to the rules and make contribution for the management of the laboratory works are evaluated as Superior (A+: top 10%). - Make active discussions on the experimental methods and results are evaluated as Excellent (A; upper 25%). - Make reliable experiments and well-organized notes and protocols are evaluated as Good (B). - Attend the scheduled experiments and submit the files of experimental notes and systemic protocols pass the examination and are evaluated as Average or upper (C or upper grades). |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | Laboratory of each professor |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Special Lectures in Human Biology II |
| Course No. | 02RA271 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC by request |
| Instructor | Akira Shibuya |
| Course Overview | Special Lectures in Human Biology II provides the opportunity for the students to attend the research progress meetings of the particular laboratories which offers specialized areas of study that the students will aspire to focus on. Featuring the latest research presentations, the students will have discussions on research achievements, learn professional knowledge, and develop their advanced skills to proceed with research activities. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | Special Lectures in Human Biology II provides the opportunity for the students to attend the research progress meetings of the particular laboratory which offers specialized areas of study that the students will aspire to focus on. Featuring the latest research presentations, the students will have discussions on research achievements, learn professional knowledge, and develop their advanced skills to proceed with research activities. |
| GIO (General Instructional Objective) | To understand the aims, objectives, materials and methods of the researches, and latest research achievements in the supervisor ' s laboratory. To discuss the presented research achievements with presenters and attendants in the meetings. To learn how to proceed with the research activities in the area of study that the students will aspire to focus on. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the objectives and recent achievements of the researches in the supervisor ' s laboratory, 2. To be able to explain the materials and methods of the researches in the supervisor ' s laboratory, 3. To discuss on the presented research achievements, 4. To make short reports on the attended research progress meetings, 5. To figure out the strategy for proceed with the research activities. |
| Course Schedule | 1.Attend the progress meetings of the supervisor ' s laboratory and discuss with presenters and attendants about the researches in the laboratory, 2.Make a one page report on each attended meeting 3.Make a final report on the research of students ' focused areas. |
| Homework | Discuss with the presenters and attendants of the research progress meetings in the supervisor ' s group. Figure out what researches are conducted in the laboratories. |
| Grading Methods and Criteria | The students are evaluated by the attendances and activities of the discussion in the progress meetings and their portfolios, including a final report and short reports on the attended meetings. In addition, the students who; - Fulfill the requirements for grade A and B further contribute others ' study by useful discussions in the meetings, and make an excellent final report on the research of their focused area are evaluated as Superior (S; top 10%), - Have active discussions at the attended meetings are evaluated as Excellent (A; upper 25%), - Create good portfolios describing good understanding of attended meeting are |

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| Assignment | |
| Textbook: | |
| Room Number | To be announced |
| Notes | |
| Keywords | |

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| Course | Special Seminars in Human Biology II |
| Course No. | 02RA272 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC by request |
| Instructor | Akira Shibuya |
| Course Overview | Special Seminars in Human Biology II engages the students in the journal club of the particular laboratory which offers the specialized area of study that the students will aspire to focus on. Featuring the latest original theses, the students should be able to understand the research objectives, methods, and results, and also have advanced discussions on the meanings, problems, and issues facing the research. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | Special Seminars in Human Biology II provides the opportunities for the students to attend the journal clubs of laboratories which are organized by students' supervisor. Featuring the latest original research papers, the students should be to have discussions on its meanings, problems, and issues facing the research, and to make original ideas which develop the research papers. |
| GIO (General Instructional Objective) | To understand the world standard of published papers in the research field where students selected. To have discussions on its meanings, problems, and issues facing the research. To cultivate the ability to gather knowledge and technical information which develop the students' thesis. To develop the technique to make a presentation. |
| SBO (Specific Behavioral Objectives) | 1. To be able to explain the meanings, problems of the research papers, 2. To discuss on issues remained in the research papers in journal clubs, 3. To make presentation to introduce the latest original research papers in the journal clubs, 4. To make idea to develop the research papers which students addressed. 5. To make short report on students presented research paper in the journal clubs. |
| Course Schedule | 1.Attend every journal clubs in the laboratory 2.have a presentation in the journal clubs. 3.make a report on the paper which students addressed in the journal clubs. |
| Homework | Discuss with the laboratory members in the journal clubs. Make original idea to develop students' own research. |
| Grading Methods and Criteria | The students are evaluated by the report of the research papers which students addressed in the journal clubs. The report should includes short introduction of the paper (background, objectives, results and discussions), and its meanings, problems, and issues facing the research, and also original idea to improve or to develop the research. In addition, the students who; - Fulfill the requirements for grad A and B further contribute others' study by useful discussions in the journal clubs and make an excellent report are evaluated as A+: top 10%. - Make active discussions on the research papers at the journal clubs and make a good report describing good discussion for research paper are evaluated as A; upper 25%. |

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| Assignment | |
| Textbook: | |
| Room Number | Day and Time, and Room Number are depends on responsible supervisors. |
| Notes | |
| Keywords | |

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| Course | Special Research in Human Biology II |
| Course No. | 02RA273 |
| Credits | 1.0Credits |
| Grade | 2Year |
| Timetable | SprABC by request |
| Instructor | Akira Shibuya |
| Course Overview | In the Special Research in Human Biology II course, the students will gain practical understanding of the principles and methods of advanced research skills in the particular laboratory which offers the specialized area of study that the students will aspire to focus on. |
| Remarks | Lectures are conducted in English. |
| Course Type | lab works, practical |
| Outline | In the Special research in human biology II course, the students understand the research background, make an experimental design of the project, and do the experiments for their thesis. |
| GIO (General Instructional Objective) | To understand the design for research, evaluation of results, decision of the next experiment, and practical skills for presentation. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to make a design of the project, 2. To be able to evaluate the experimental results, 3. To be able to make a decision to proceed the project, 4. To be able to discuss about the experimental results with faculty member and lab members, 5. To be able to give the presentation and discussion under the proper research background. |
| Course Schedule | <ol style="list-style-type: none"> 1.Design the project and do the experiments, 2.Make a decision to proceed the project. 3.Give the presentation and discussion in lab meeting |
| Homework | |
| Grading Methods and Criteria | <p>Students are evaluated by the design of project, practical skills and results of experiment, and presentation.</p> <p>In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further give the presentation and discussion under the proper research background will be evaluated as Superior (A+: top 10%). - Make well-organized results and active discussion will be evaluated as Excellent (A; upper 25%). - Make well-organized project design and reliable experiments will be evaluated as Good (B). - Design the project and organized daily experiments are evaluated as Average or upper (C or upper grades). |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | Laboratory of each professor |
| Notes | |
| Keywords | |

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| Course | Special Practice in Human Biology I |
| Course No. | 02RA280 |
| Credits | 2.0Credits |
| Grade | 1Year |
| Timetable | FallABC by request |
| Instructor | Akira Shibuya |
| Course Overview | In this course, the students will learn methods to acquire basic knowledge required for selecting a topic for their dissertation through tutorials with their mentoring instructors. The students will also select the subject for their research through discussion, determine approaches for conducting the research, go through application procedures necessary for the research such as animal experiments and genetic recombination, and then plan their dissertation. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises |
| Outline | In the Special Practice in Human Biology I, the students will learn methods to acquire basic knowledge required for selecting a topic for their dissertation through tutorials with their mentoring instructors. The students select the subject for their research through discussion with initial mentoring instructors and possible research supervisors, determine approaches for conducting the research, go through application procedures necessary for the research such as animal experiments and genetic recombination, and then plan their dissertation. |
| GIO (General Instructional Objective) | To become proficient at accumulating basic knowledge and information on global problems and their research status in the field aspiring to select as a topic for dissertation. To list up the required research methods, regulations and application procedures necessary for the researches. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to explain the world trends to solve global problems, 2. To be able to explain the significance of the selected research subjects in the world, 3. To be able to explain research methods required to conduct the researches, 4. To be able to explain regulations and application procedures required for the researches. |
| Course Schedule | <ol style="list-style-type: none"> 1.1. Discuss with initial mentoring instructors about the global problems to be solved, and learn how to find textbooks, research papers, and other academic reports useful for deeper understanding of the problems, 2. Make appointments with possible research supervisors and any other people in the world, and discuss about the possible approaches to solve the global problems, 3. Study regulations and application procedures required for thesis researches under the supervision of initial mentoring instructors and the candidate research supervisors. 4. Submit project proposals. |
| Homework | Discuss with classmates about global problems to be solved. |
| Grading Methods and Criteria | <p>The students are evaluated by the project proposals, including Backgrounds, Global Problems to be solved, objectives of the PhD program in Human Biology, Methods, Required Regulations and Application Procedures, and expected results and the significances.</p> <p>In addition, the students who;</p> <ul style="list-style-type: none"> - Fulfill the requirements for grade A and B further provide an excellent original idea to approach global problems are evaluated as Superior (A+: top 10%); - Make a significant and feasible proposals are evaluated as Excellent (A; upper |

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| Assignment | |
| Textbook: | |
| Room Number | Laboratory of each professor |
| Notes | |
| Keywords | |

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|---------------------------------------|--|
| Course | Special Practice in Human Biology II |
| Course No. | 02RA281 |
| Credits | 10.0Credits |
| Grade | 2Year |
| Timetable | Annual by request |
| Instructor | Akira Shibuya |
| Course Overview | In this course, the students should be able to acquire 1) methods for evaluation of each result of their research leading to their dissertation writing, 2) skills to develop and modify their research plan and conduct their research based on the plan, and 3) skills to write their dissertation from accumulated research results. |
| Remarks | Lectures are conducted in English. |
| Course Type | class exercises and |
| Outline | In the Special Practice in Human Biology II, the student should be able to acquire 1) methods for evaluation of each result of their researches led to their dissertation writing, 2) skills to develop and modify their research plan and conduct their research based on the plan, and 3) skills to write their dissertation from accumulated research results. The students conduct their own research through discussion with research supervisors. |
| GIO (General Instructional Objective) | Laboratory of each professor |
| SBO (Specific Behavioral Objectives) | To become proficient at accumulating broad knowledge and information on global problems and their research status in the field aspiring to select as a topic for dissertation. To acquire methods for evaluation of each result of their researches based on the plan led to their dissertation writing. |
| Course Schedule | 1.According to the submitted project proposals in the Special Practice in Human Biology I, learn the skills to develop and modify their research plan through discussion with research supervisors, 2.Conduct their own research under the supervision of research supervisors, 3.Learn the skills to write their dissertation from accumulated research results, 4.Summarize the progress report. |
| Homework | |
| Grading Methods and Criteria | The students are evaluated by the report on progress, including Backgrounds, Global Problems to be solved, objectives of the PhD program in Human Biology, Methods, Results, the Significances, and further Perspectives. In addition, the students who; - Fulfill the requirements for grade A and B further provide an excellent original idea to approach global problems are evaluated as Superior (A+: top 10%); - Make a significant and feasible progress reports are evaluated as Excellent (A; upper 25%); - Make a good progress reports from the significant points of view are evaluated as Good (B). - Submit the progress reports with required contents pass the examination and are evaluated as Average or upper grades (C or upper grades). |

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| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | explain,significance,selected,subjects,develop,modify,based,plan,able,conduct,researches,and,acc |

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|---------------------------------------|--|
| Course | International Human Biology Exchange Program I |
| Course No. | 02RA290 |
| Credits | 1.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by appointment |
| Instructor | Mitsuru Okuwaki |
| Course Overview | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| GIO (General Instructional Objective) | This course aims to equip students with skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in a specific field of human biology. Students will be able to develop their own career with taking advantage of global information and human network. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to understand the basic concept and knowledge of the specific field of human biology. 2. To be able to perform research in the specific field of basic biological sciences by communicating with overseas researchers. 3. To be able to explain the scientific issues that remain to be addressed in the specific field of human biology. 4. To be able to write a report to explain original ideas for the development of human biology. |
| Course Schedule | Introductory lecture (To be announced) Research activities in partner universities in abroad (Listed in below) |
| Homework | To be announced if any. |
| Grading Methods and Criteria | Evaluation by overseas researcher(s) 50% Report 50% |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Submission of report: Details will be announced at the introductory lecture. |
| Textbook: | N/A |
| Room Number | Room 706, Laboratory of Advanced Research A Building Partner universities in abroad |
| Notes | Need to contact to the responsible faculty before registration. |
| Keywords | |

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|---------------------------------------|--|
| Course | International Human Biology Exchange Program II |
| Course No. | 02RA291 |
| Credits | 1.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by appointment |
| Instructor | Mitsuru Okuwaki |
| Course Overview | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| GIO (General Instructional Objective) | This course aims to equip students with skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in a specific field of human biology. Students will be able to develop their own career with taking advantage of global information and human network. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to understand the basic concept and knowledge of the specific field of human biology. 2. To be able to perform research in the specific field of basic biological sciences by communicating with overseas researchers. 3. To be able to explain the scientific issues that remain to be addressed in the specific field of human biology. 4. To be able to write a report to explain original ideas for the development of human biology. |
| Course Schedule | Introductory lecture (To be announced) Research activities in partner universities in abroad (Listed in below) |
| Homework | To be announced if any. |
| Grading Methods and Criteria | Evaluation by overseas researcher(s) 50% Report 50% |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Submission of report: Details will be announced at the introductory lecture. |
| Textbook: | N/A |
| Room Number | Room 706, Laboratory of Advanced Research A Building Partner universities in abroad |
| Notes | Need to contact to the responsible faculty before registration. |
| Keywords | |

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| Course | International Human Biology Exchange Program III |
| Course No. | 02RA292 |
| Credits | 1.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by appointment |
| Instructor | Mitsuru Okuwaki |
| Course Overview | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | This course aims to equip students with advanced scientific knowledge of the human biology-related field, skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in international research field. Students will be able to develop their own career with taking advantage of global information and human network. |
| GIO (General Instructional Objective) | This course aims to equip students with skills of English research presentation, practical communication with overseas researchers and academic staffs, and of debate in a specific field of human biology. Students will be able to develop their own career with taking advantage of global information and human network. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to understand the basic concept and knowledge of the specific field of human biology. 2. To be able to perform research in the specific field of basic biological sciences by communicating with overseas researchers. 3. To be able to explain the scientific issues that remain to be addressed in the specific field of human biology. 4. To be able to write a report to explain original ideas for the development of human biology. |
| Course Schedule | Introductory lecture (To be announced) Research activities in partner universities in abroad (Listed in below) |
| Homework | To be announced if any. |
| Grading Methods and Criteria | Evaluation by overseas researcher(s) 50% Report 50% |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | Submission of report: Details will be announced at the introductory lecture. |
| Textbook: | N/A |
| Room Number | Room 706, Laboratory of Advanced Research A Building Partner universities in abroad |
| Notes | Need to contact to the responsible faculty before registration. |
| Keywords | |

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|---------------------------------------|--|
| Course | Advanced Topics in Biotechnology and Medicine I |
| Course No. | 02RA293 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | SprABC Intensive |
| Instructor | Kiong Ho, Ryosuke Ohniwa |
| Course Overview | In order to nurture world-level communication/discussion skills and leadership in scientific community, this course is performed in abroad with the cooperation of universities in foreign countries. The students are expected to work together with the local students and lead the group discussion. |
| Remarks | Lectures are conducted in English. Not open in 2016. |
| Course Type | lectures |
| Outline | Many graduate students have trouble formulating a research plan, which includes defining the hypothesis, constructing the aims of the project, and designing an experimental approach to address the questions they set forth in the aims. The objective of this course is to inspire and assist students to think critically and develop deep understanding in scientific thinking to come up with an original research proposal. Groups of students will be given selected research articles in the field of biomedical sciences. Students will discuss methodologies, evaluate the results, and identify scientific issues that remain to be addressed to advance the research. Each group will come up with a research plan, present their ideas by chalk-talk session to other groups, and revise the proposal based on feedback from their peers. Lastly, students will present their final proposal for evaluation. In order to nurture world-level communication/discussion skills and leadership in scientific community, this course is performed in abroad with the cooperation of universities in foreign countries. The students are expected to work together with the local students and lead the group discussion. |
| GIO (General Instructional Objective) | To understand how to formulate a world class-level research plans, present their ideas by chalk-talk session and refine their research proposal through suggestion from peers. |
| SBO (Specific Behavioral Objectives) | 1. To be able to read, discuss, and evaluate scientific manuscripts. 2. To be able to identify scientific issues that remain to be addressed. 3. To be able to formulate new research plan. 4. To be able to present ideas to other students and stimulate discuss. 5. To be able to refine the research plan with suggestions from other students. |
| Course Schedule | Introductory Lecture (To be announced) 3 4 days session at the Partner University abroad (described below) |
| Homework | Submission of report at the beginning and end of the course. |
| Grading Methods and Criteria | Initial report 5 % Class participation 80% Final report 15% |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: Good (70-79) C: Average (60-69) D: Failure (less than 60) |

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| Assignment | Submission of report: Instructors will post research articles relevant to the study online 1 month prior to the course. Students will read the assign papers and submit a short report 1 week before the class begins. |
| Textbook: | N/A |
| Room Number | Room 706, Laboratory of Advanced Research A Building Partner universities in abroad |
| Notes | Students shall take either Advanced Topics in Biotechnology and Medicine I or II only. Preferred Class Size: 12 -18 students Participating audience: 1st or 2nd year Masters students or a 1st year PhD students from the partner university, majoring in Biology, Biochemistry, Biomedical Sciences will join the course. |
| Keywords | |

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|---------------------------------------|--|
| Course | Advanced Topics in Biotechnology and Medicine II |
| Course No. | 02RA294 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | FallABC Intensive |
| Instructor | Kiong Ho, Ryosuke Ohniwa |
| Course Overview | In order to nurture world-level communication/discussion skills and leadership in scientific community, this course is performed in abroad with the cooperation of universities in foreign countries. The students are expected to work together with the local students and lead the group discussion. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | <p>Many graduate students have trouble formulating a research plan, which includes defining the hypothesis, constructing the aims of the project, and designing an experimental approach to address the questions they set forth in the aims. The objective of this course is to inspire and assist students to think critically and develop deep understanding in scientific thinking to come up with an original research proposal. Groups of students will be given selected research articles in the field of biomedical sciences. Students will discuss methodologies, evaluate the results, and identify scientific issues that remain to be addressed to advance the research. Each group will come up with a research plan, present their ideas by chalk-talk session to other groups, and revise the proposal based on feedback from their peers. Lastly, students will present their final proposal for evaluation.</p> <p>In order to nurture world-level communication/discussion skills and leadership in scientific community, this course is performed in abroad with the cooperation of universities in foreign countries. The students are expected to work together with the local students and lead the group discussion.</p> |
| GIO (General Instructional Objective) | To understand how to formulate a world class-level research plans, present their ideas by chalk-talk session and refine their research proposal through suggestion from peers. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To be able to read, discuss, and evaluate scientific manuscripts. 2. To be able to identify scientific issues that remain to be addressed. 3. To be able to formulate new research plan. 4. To be able to present ideas to other students and stimulate discuss. 5. To be able to refine the research plan with suggestions from other students. |
| Course Schedule | <p>Introductory Lecture (To be announced)</p> <p>3 4 days session at the Partner University abroad (described below)</p> |
| Homework | Submission of report at the beginning and end of the course. |
| Grading Methods and Criteria | <p>Initial report 5 %</p> <p>Class participation 80%</p> <p>Final report 15%</p> |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> <p>D: Failure (less than 60)</p> |

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| Assignment | Submission of report: Instructors will post research articles relevant to the study online 1 month prior to the course. Students will read the assign papers and submit a short report 1 week before the class begins. |
| Textbook: | N/A |
| Room Number | Room 706, Laboratory of Advanced Research A Building Partner universities in abroad |
| Notes | Students shall take either Advanced Topics in Biotechnology and Medicine I or II only. Preferred Class Size: 12 -18 students Participating audience: 1st or 2nd year Masters students or a 1st year PhD students from the partner university, majoring in Biology, Biochemistry, Biomedical Sciences will join the course. |
| Keywords | |

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|---------------------------------------|--|
| Course | Genomics Database Access and Application |
| Course No. | 02RA302 |
| Credits | 1.0Credits |
| Grade | 1Year |
| Timetable | Spring Semester Fri5,6 |
| Instructor | Masafumi Muratani |
| Course Overview | Recent advances in DNA sequencing technologies allowed scientists to obtain large scale data from genome and epigenome analysis. Most of datasets acquired so far are accessible for the research community. However, to appreciate full potential of these resources, it is essential to know how to find and use the data. Researchers are also expected to be aware of ethical concerns when handling clinical genomics data. In this course, students will learn how to access genomics databases and bioinformatics tools through hands-on experiences of typical sequencing data analysis. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | In this practical course, students will analyze RNA-sequencing and chromatin immunoprecipitation (ChIP)-sequencing datasets. Analysis workflows include essential aspects of genomics data applications including standard data format, conversion of data types and usage of web tools. This course also provides opportunities to experience basic data handling in Linux environment, so that students can download, install and use various analysis tools according to future individual research needs. |
| GIO (General Instructional Objective) | <ol style="list-style-type: none"> 1. To download and analyze publically available genomics data. 2. To semi-automate data analysis using shell scripting in Linux environment. |
| SBO (Specific Behavioral Objectives) | <ol style="list-style-type: none"> 1. To learn typical structure of genomics datasets by exploring UCSC Genome Browser and processing data in Galaxy platform. 2. To understand how to install and use analysis tools in Linux environment using command line interface. 3. Students with prior computational background are encouraged to learn how informatics tools help ‘ wet-lab ’ scientists in genomics studies. |
| Course Schedule | <p>1.Jul 1 Standard data format, UCSC Genome browser, Galaxy and web tools</p> <p>2.Jul 8 Linux shell scripting for batch data processing and analysis workflow</p> <p>3.Jul 15 Analysis of published datasets (for project assignment)</p> <p>4.Jul 22 Genomics data privacy and clinical research ethics</p> <p>5.Jul 29 Assignment presentation and review</p> |
| Homework | Simple problem sets will be provided for each section |
| Grading Methods and Criteria | <p>Class participation 50%</p> <p>Final assignment 50%</p> |
| Grading Criteria | <p>A+: Superior (more than 90: top 10%)</p> <p>A: Excellent (80-89: upper 20%)</p> <p>B: Good (70-79)</p> <p>C: Average (60-69)</p> |

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| Textbook: | Students are encouraged to utilize web tutorials provided by tool developers and informatics community. |
| Room Number | Room 212 (Satellite Room), 4B Building, Medical Area |
| Notes | |
| Keywords | |

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|---------------------------------------|---|
| Course | Practical Training of Career Management |
| Course No. | 02RA303 |
| Credits | 10.0Credits |
| Grade | 3 - 5Year |
| Timetable | Annual by request |
| Instructor | Akira Shibuya |
| Course Overview | In this course, the students are expected to have opportunities to undertake practical business training at private companies, relevant government offices, or independent administrative corporations for their career development and management possible after completion of the Ph. D. program. |
| Remarks | Lectures are conducted in English. |
| Course Type | lectures |
| Outline | A practical training of career management will be approved for on-the-job work experience by which the students are considered as a candidate for employee after completion of the program. On-the-job trainings will provide the students with knowledge of future career paths, help them gain an understanding of the roles of Ph.D. holders in today ' s business and social settings, and how they will better prepare to become successful professions. |
| GIO (General Instructional Objective) | To crystallize future career plans through on-the-job experiences |
| SBO (Specific Behavioral Objectives) | To learn through experiences with the role of advanced studies and translational research in business settings |
| Course Schedule | |
| Homework | |
| Grading Methods and Criteria | The training providers should evaluate students ' performance after completion of on-the-job trainings. The students should be evaluated by writing reports based on their experience-based learning. |
| Grading Criteria | A+: Superior (more than 90: top 10%) A: Excellent (80-89: upper 20%) B: good (70-79) C: Average (60-69) D: Failure (less than 60) |
| Assignment | |
| Textbook: | |
| Room Number | |
| Notes | |
| Keywords | career,opportunities,design,thinking,professionals,future,business,communication,social,norms,j |